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Biological Affinities and the Construction of Cultural Identity for the Proposed Coosa Chiefdom

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To the Graduate Council:

I am submitting herewith a dissertation written by Michaelyn S. Harle entitled "Biological Affinities and the Construction of Cultural Identity for the Proposed Coosa Chiefdom." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Anthropology.

Lynne P. Sullivan, Gerald F. Schroedl, Major Professor

We have read this dissertation and recommend its acceptance:

Lyle W. Konigsberg, Benjamin M. Fitzpatrick

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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BIOLOGICAL AFFINITIES AND THE CONSTRUCTION OF CULTURAL IDENTITY WITHIN THE PROPOSED COOSA CHIEFDOM

A Dissertation Presented for the Doctor of Philosophy Degree
The University of Tennessee, Knoxville

Michaelyn Suzanne Harle
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Abstract

This study couples biological data with aspects of material culture and mortuary ritual for several sites within the proposed Coosa chiefdom described by sixteenth-century Spanish accounts to explore how cultural identities were actively constructed and maintained within the region. The primary goal is to examine regional interactions between these communities and their constructions of social identity and sociopolitical dynamics vis à vis their biological affinities. Questions regarding regional interactions between these groups have been a stimulus for archaeological debate. These interactions may have played a crucial role in the construction of separate cultural identities. What is not clear is to what extent differences in cultural identity reflect or are related to differences in biological relationships.

The skeletal samples used in this study represent six Late Mississippian archaeological sites assigned to three archaeological phases: the Dallas Phase, Fains Island (40JE1), Cox (40AN19), and David Davis (40HA301) sites; the Mouse Creek Phase, Ledford Island (40BY13) site; and the Barnett Phase, King (9FL5) and Little Egypt (9MU102) sites. Twenty-seven dental and 22 cranial nonmetric traits were recorded for 923 individuals. Biological affinities were calculated using the Mahalanobis D^2 statistic for the cranial and dental non-metric traits. Biological Distance measures were compared to a geographic matrix to examine isolation by distance between the sites. Further analysis was conducted by constructing an R matrix to examine levels of heterogeneity.

Comparisons between biological distance and geographical distances suggest that the samples used in this analysis do not conform to the expected isolation-by-distance model. Furthermore, East Tennessee groups appear distinct from their North Georgia neighbors

suggesting little biological interaction between these groups. The results of the biological distance analysis conforms to differences in material culture and mortuary ritual between these groups. The results suggests that if there was a political alliance within the region for this period it is not associated with biological relatedness nor did it act as a unifying force for individual communities' cultural identity.

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Chapter I: Introduction

The constitution of late prehistoric groups in the interior Southeast has long captivated archaeologists. Synchronic and diachronic research regarding this question is often directly influenced by the dominant theoretical paradigm of the time. Yet, bioarchaeological perspectives rarely inform these discussions. This omission is unfortunate given that skeletal data offer a unique perspective that cannot be provided by material culture studies or ethnohistorical data alone.

This study investigates biological relationships and cultural interactions between sixteenth-century, Late Mississippian communities in eastern Tennessee and adjacent northern Georgia in order to assess biological distance as a proxy of genetic relatedness. The primary goal is to examine regional interactions between these communities and their constructions of social identity and sociopolitical dynamics vis à vis their biological affinities. I examine variation in dental and cranial nonmetric traits between and among contemporaneous skeletal samples from these communities. The skeletal samples used in this study represent six Late Mississippian archaeological sites assigned to three archaeological phases: the Dallas Phase Fains Island, Cox, and David Davis sites; the Mouse Creek Phase Ledford Island site; and the Barnett Phase King and Little Egypt sites (Figure 1-1). The archaeological phases represented in the study are contemporaneous and the radiocarbon dates suggest that the sites themselves were occupied contemporaneously (Tables 1-1 and 1-2). Questions regarding regional interactions

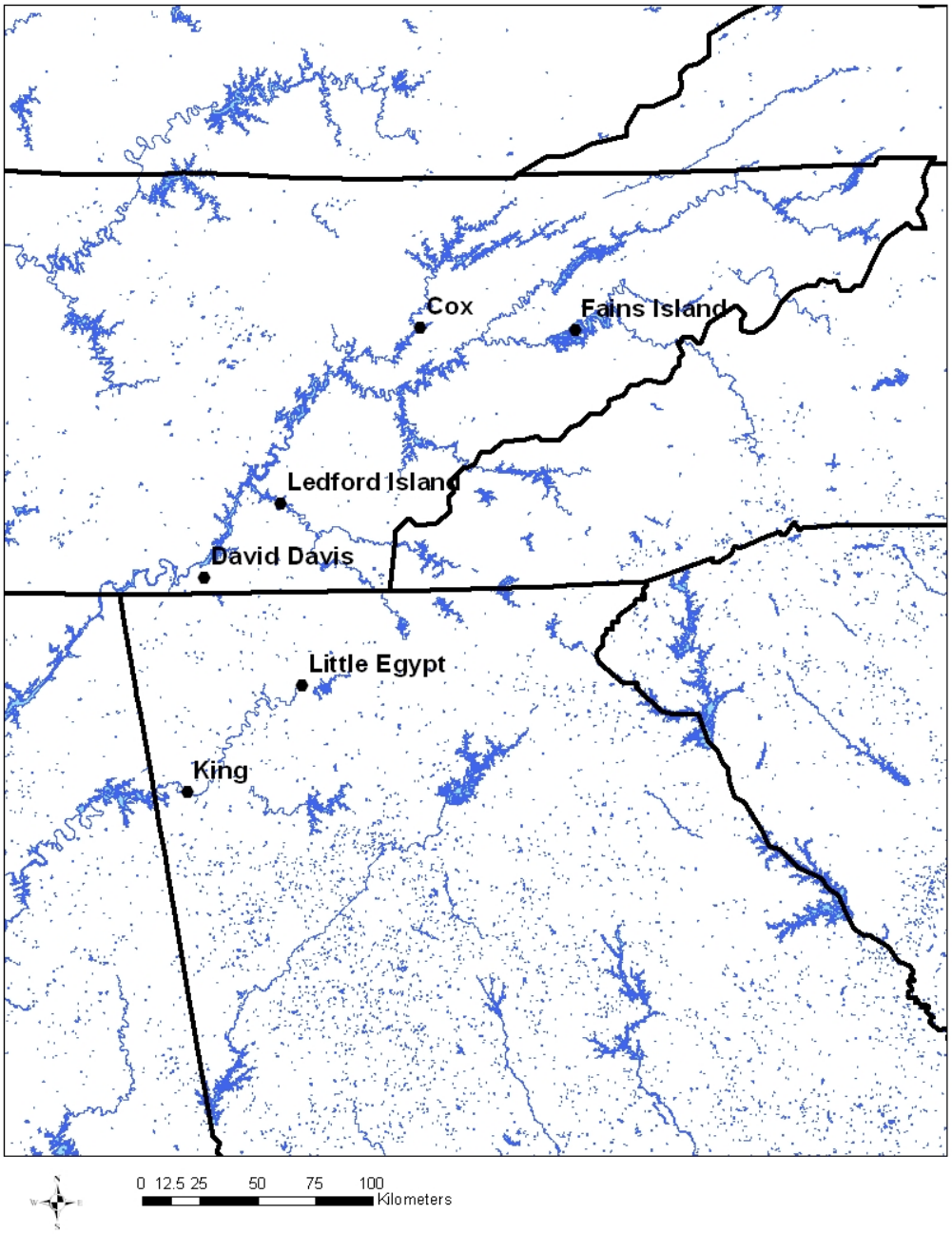


Figure 1-1: Location of sites used in the current study

Table 1-1: Radiocarbon dates for sites used in the current study (Dates were calibrated through incal04.14c Stuiver and Reimer 1993)

Site/Phase	**Lab Number**	**Sample Provenience**	**BP**	**+/-**	**One Sigma Calibrated Date**	**Reference**
Little Egypt/Barnett	UGA208	Structure 1	425	55	AD 1426-1512	Hally 1980
	UGA205	Structure 1	500	55	AD 1329-1449	Hally 1980
	UGA 210	Provenience not given	395	65	AD 1440-1625	Hally 1980
King/Barnett	UGA 589	Structure 8	280	70	AD 1492-1667	Hally 2008
	UGA 591	Structure 4	120	65	AD 1682-1894	Hally 2008
	UGA 307	Structure 2	540	55	AD 1340-1434	Hally 2008
Ledford Island/ Mouse Creek	A-3342	Feature 38n	450	50	AD 1414-1481	Sullivan 1983
Cox/Dallas	AA80150	Mound Str. 3	386	36	AD 1447-1551	Sullivan et al 2009
	AA80151	Village	332	36	AD 1494 -1602	Sullivan et al. 2009
	AA80152	Village	350	36	AD 1477-1636	Sullivan et al., 2009
Fains Island/Dallas	Beta-179901	Mound	370	30	AD 1454-1518	Harle 2003

Table 1-2: Phases represented in the regions associated with the study

	Phases	
	North Georgia [1] [2]	East Tennessee [3]
A.D. 1800	Boyd/Galt	Overhill
A.D. 1700	Estatoe	
	Tugaloo	
A.D. 1600	Barnett/Brewster	Dallas/Mouse Creek
A.D. 1500		
	Little Egypt/Stamp Creek	
A.D. 1400		Dallas
	Late Savannah/Wilbanks	
A.D. 1300		Hiwassee Island
A.D. 1200	Savannah	
A.D. 1100	Etowah	
A.D. 1000	Woodstock	Martin Farm
A.D. 900		

[1] after Hally 2008
[2] after King 2003
[3] after Schroedl 1998

between the communities represented by these sites are a stimulus for research and debate. These interactions may have played a crucial role in the construction of separate cultural identities. What is not clear is to what extent differences in cultural identity reflect or are related to differences in biological relationships. I explore these relationships with the goal of shedding some light on the relatedness of these groups—both cultural and biological—and how these factors may relate to proposed political relationships among these communities.

Regional Importance of the Study

The interaction, formation, maintenance, and dissolution of social groupings are of particular interest for archaeologists focusing on the Mississippian period (AD 800 – 1600). What exactly constitutes "Mississippian" culture is often contentious, but the phrase generally refers to late prehistoric cultures within the regional area of the Southeast and southern Midwest that share common themes in material culture, architectural style, monumental earthworks, and iconography. As archaeological theory came of age during the early to mid-nineteenth century, a great deal of focus was placed on classification, the process of ascribing names or different cultural groups to geographically and/or temporally circumscribed material traits. Often referred to as the cultural historical or cultural classificatory approach, this theoretical movement was based on the assumption that similar material traits represented similar cultural histories (Willey and Sabloff 1974). This cultural historical paradigm was intimately linked with another guiding principle, the "direct historical approach," in which researchers attempted to work backwards from written documents of historic Native tribes to unknown prehistoric cultures. The direct historical approach was especially popular during the 1930s and 1940s as archaeologists trained

to use this method directed large-scale archaeological excavations in the Southeast funded by the Works Progress Administration (WPA) (Lewis et al. 1995).

Pertinent to the focus of the study presented here are the excavations and research conducted under direction of T.M.N. Lewis and Madeline D. Kneberg (Lewis et al. 1995). Working within this classificatory paradigm, Kneberg and Lewis distinguished two late prehistoric/protohistoric phases in east Tennessee: Dallas and Mouse Creek. Based on ethnohistorical information about historic native tribes and on material differences between Dallas and Mouse Creek sites, Lewis and Kneberg (1946; Kneberg 1952; Lewis et al. 1995; Bauxar 1957) used the direct historic approach to equate the Dallas and Mouse Creek cultures to ancestral Muskogee (Creek) and Tsoyaha (Yuchi), respectively. To Lewis and Kneberg, the Cherokee were relative latecomers into the East Tennessee region.

Other researchers questioned Lewis and Kneberg's categorizations. Mason (1963) outlined distinct differences in material culture from a known Yuchi site in Alabama and that of the Mouse Creek sites in Tennessee. In fact, Mason suggested that ceramics styles at the Yuchi site are more similar to those at Dallas sites. Furthermore, she disputed the correlation of Yuchi and Mouse Creek architectural styles. She argues that architectural similarities between these sites are simply representative of a large-scale Southeastern phenomenon. Likewise, Coe (1961) and Dickens (1979) disputed Lewis and Kneberg's characterization of Cherokees as latecomers to the Tennessee Valley. Coe (1961) suggested that regional differences within late prehistoric cultures in East Tennessee, the Appalachian Summit, and Northern Georgia could be equated to regional historic Cherokee distinctions. Likewise, Dickens (1979) suggested the Dallas Phase should be considered prehistoric Overhill Cherokee, based on material trait correlations.

Dickens (1986) later would suggest that Cherokee configurations in the region were perhaps more complex than he originally argued, a point I will return to in the following chapter.

Perhaps the most damaging aspect on Lewis and Kneberg's classificatory scheme was the paradigm shift to processual archaeological theory. Although classificatory nomenclature, such as "phases", was retained, concepts such as ethnicity, which were promoted by WPA researchers, were no longer of interest and shown to be too simplistic in their categorization. Archaeologists instead began to focus more on socioeconomic divisions within a systems theory framework (Trigger 1989). Research on the Mississippian Period in particular focused on these communities as examples of cultural neoevolutionary stages, specifically chiefdom level societies (Fried 1967; Service 1971). Grouping sites into polities or individual chiefdoms and examining their formation and dissolution replaced the identification of ethnic groups or cultures based on material culture (e.g., Anderson 1994; Beck 2003; Blitz 1999; Cobb 2003; Peebles and Kus 1977; Smith 1979; Steponaitis 1978).

In East Tennessee, a great deal of archaeological research has been generated regarding the region's role within a larger sociopolitical system. Based largely on sixteenth-century Spanish reports, Hudson and coworkers (Hally and Langford 1988; Hally et al. 1990; Hally 1994b, Hudson et al. 1985, 1987) suggest a connection of Dallas, Mouse Creek, and northern Georgia (Barnett and Brewster Phases) sites, through a chiefly alliance. They argue that this region was linked in a confederation subject to the paramount chiefdom in Coosa, possibly centered at the northern Georgia site, Little Egypt. Some (e.g., Boyd and Schroedl 1987) contested this interpretation, and some researchers involved in the Coosa reconstruction concede that archaeological evidence for such a confederation has remained largely undiscovered and that

if such a confederation existed, it existed only briefly and perhaps existed in symbolic nature only (Hally et al. 1990; Hally 1999).

While the nature and extant of the Coosa chiefdom is an ongoing debate, what is evident is that sites within the Coosa reconstruction exhibit a great deal of internal variation. Within the Dallas Phase alone there appear to be significant differences in mortuary practices both temporally and spatially (Harle 2003; Koerner 2005; Vogel 2007). Examination of the Mouse Creek Phase in relation to Dallas Phase sites elsewhere in the region amplifies this variation (Sullivan and Harle 2010).

To make sense of variability within the Mississippian period, some researchers have revisited notions of ethnicity and cultural identity that may or may not subsume sociopolitical structures (Alt 2002; Emerson and Hargrave 2000; Pauketat 1998, 2000; Sullivan and Harle 2010). In general, in the last two decades archaeologists have returned to the construction of ethnic or cultural identity as an important avenue of research, albeit with a more nuanced approach (for an in-depth review c.f., Lucy 2005 and Jones 2002). Starting with Fedrik Barth's (1969) seminal work on ethnicity, anthropologists, and by extension archaeologists, began to understand that cultural identity, while not completely malleable, is by no means fixed and can be situational depending on context (Lucy 2005). Researchers now reject the idea of a one-to-one relationship between material cultural diagnostics, language, or even biology and cultural identity or ethnicity (Emberling 1997; Lucy 2005). Rather than simply classifying differences in material traits in order to reconstruct social groups, one must examine how individuals *used* these material traits in the past actively to construct social identities.

Projecting social meaning of material objects in the past is difficult at best. Nonetheless, several avenues of research have been shown to be particularly fruitful in this regard. For example, pottery styles (e.g., Emberling 1997), architecture (e.g., Alt 2002; Emerson and Hargrave 2000), diet (e.g., Crist 1995), body modification and/or ornamentation (e.g., Blom et al. 1998; Joyce 2005; Logan et al. 2003; Sullivan and Harle 2010; Torres-Rouff 2002), and burial practices (Beck 1995; Sullivan and Harle 2010) have been employed as starting points for examining ethnic or other forms of cultural identity. The goal is not to establish mere trait lists, but as Emberling (1997:311) writes to "identify which characteristics would have been socially meaningful in a particular social situation, and which were unimportant."

Based on differences in mortuary treatment and the use of funerary objects, Sullivan and Harle (2010) argue that contemporaneous occupations at the Mouse Creek Phase Ledford Island and the Dallas Phase Fains Island sites mark differences in the construction of cultural identities. They suggest that differences in regional spheres of interactions, specifically northern Georgia and western North Carolina groups, and historical trajectories may have played a part in regional distinctions in cultural identity. Emic perceptions of this cultural distinction are unclear. Did these groups consider themselves distinct ethnic groups or "distinct groups within a larger cultural tradition that encompassed other distinct, contemporary enclaves in the Upper Tennessee Valley" (Sullivan and Harle 2010:248) similar to the regional distinctions among the Overhill, Out, and Valley towns of the historic Cherokee? Furthermore, Fains Island and Ledford Island were just two of the many contemporaneous towns occupied in East Tennessee. This type of analysis should be expanded within the broadly defined Dallas culture. Likewise, how these

cultural distinctions may fit within the sociopolitical framework proposed by the Coosa model needs to be addressed.

Temporal Importance of the Study

The Late Mississippian Period (AD 1400-1600) was a time of great social reorganization even prior to Spanish contact. Large portions of the mid-continent along the lower-Ohio, Mississippi, and Cumberland River valleys were abandoned or reorganized in such a way to make those groups archaeologically invisible (Cobb and Butler 2002; Meeks 2006; Milner et al. 2001; Williams 1983, 1990, 2001). Preeminent towns at Cahokia in the American Bottom and Moundville along the Black Warrior River were either completely abandoned or significantly diminished in power and/or influence (Knight and Steponaitis 1998; Pauketat 2004). Communities in eastern Tennessee and northern Georgia appear to have escaped this fate that occurred elsewhere in the Mississippian world. In fact, East Tennessee towns became more firmly established, densely occupied towns. Yet, by the close of the Late Mississippian Period, there appears to be a social reorganization in which at least some Late Mississippian towns in eastern Tennessee became more egalitarian in nature (Harle 2003; Schroedl 1986; Sullivan 1986). Spanish presence in the region, whether through direct or peripheral contact, may have exacerbated this reorganization that laid the groundwork for the development of historic tribal societies within the region.

From a population genetics perspective, this instability and social reorganization is important because it can directly affect the permeability of social and mate exchange boundaries that may affect the biological composition of a group. Factionalism or competition over

diminishing resources may lead to less permeable social boundaries (Ferguson and Whitehead 1992; Hill 1996). Conversely, social instability, population movement, and demographic collapse caused by contact with Europeans may have lead to coalescence of formerly socially distinct groups. Based on archaeological evidence, this latter argument has been suggested for the development of historic Choctaw, Creek, and Cherokee groups (Galloway 1995, 2002; Knight 1994; Rodning 2002; Smith 2002) — a phenomenon that Hudson and Ethridge (2002) have referred to as "coalescent societies." These coalescent societies may not simply be indicative of the Historic Period but more of a continuation of sociopolitical processes that occurred during the Mississippian Period in times of politically instability. Likewise, evoking Kopytoff's (1987) internal frontier model for African societies, Hally (2006:27-28) suggests that the formation of new Mississippian chiefdoms in formerly unoccupied or marginalized zones could have occurred during politically unstable times. Hally (2006:28) writes "Disaffected and displaced individuals often left their homes in large numbers and moved to frontier areas, where they attempted to establish new communities." Hally's argument is not unlike Blitz's (1999) fission/fussion model that will be discussed in detail in the following chapter. Theoretically, this fissioning (to evoke Blitz's 1999 term) process should have biological or genetic consequences. Several studies of nonhuman primate groups have demonstrated that when part of the group fissions along familial lines, these founder groups will be genetically distinct from the parent group (Melnick 1987). Even random fissioning not necessarily along familial lines will lead to some genetic divergence due to the decrease in effective population size, although the amount of genetic divergence is in some ways directly related to the amicability of this fissioning process (Smouse et al. 1981). For instance, among the Yanomamo, hostility between the founding

population and the parent population limit gene flow and thus lead to an even greater genetic divergence (Smouse et al. 1981). Conversely, if an amicable split occurs where mate exchange still occurs between populations, genetic differentiation is still evident, but is not as pronounced.

Rodning (2002:115-116) asks, "What process drove the coalescence of native communities in this region into the particular configuration in which English traders found them during the early and mid-eighteenth century?" As Lightfoot (1995) argues, in order to answer this question we must first have a firm grasp on these groups prior to contact so that comparisons can be made. Only through the understanding of how these social groups were constructed, maintained, and interacted on the eve of contact can we truly understand the impact that European explorers had on these communities and the process of ethnogenesis (the study of the formation of ethnic groups) that gave rise to the historic Creek, Cherokee, and Yuchi communities.

Goals of the Study

Several specific questions are pertinent to this study. First, does the variation in material culture among adjacent Late Mississippian groups in the Valley and Ridge Province of eastern Tennessee and northern Georgia represent endogamous cultural groups? Alternatively, were mating networks more fluid in nature and thus transcended material cultural boundaries? Furthermore, were mating networks used to establish alliances between a diverse and dispersed society?

Bioarchaeological analysis, especially in the form of biological distance studies, can be a

particularly useful tool in not only understanding cultural and/or sociopolitical boundaries, but also understanding the process of ethnogenesis (Blom et al. 1998; Konigsberg and Buikstra 1995; Knudson and Stojanowski 2008; Nystrom 2006; Schillaci and Stojanowski 2006; Stojanowski 2005). Within biological distance studies, the assumption is that if populations frequently exchange mates, there will be a small genetic distance between them in regards to phenotypic attributes, and vice versa. In general, it is assumed that geographically proximate samples should result in greater mate exchange and thus greater phenotypic similarity, a model referred to as isolation-by-distance (Konigsberg 1990). For example, using the isolation-by-distance model as illustrated in Figure 1-2, geographically closer samples A and B should be more phenotypically similar than sample C. Assuming that A represents a population from a Barnett Phase community and B and C represent Dallas Phase groups, if a cultural boundary exists between Barnett and Dallas groups, then we would expect population B to be more phenotypically similar to C than A even though they are geographically further apart. Deviation from the expected isolation-by-distance model would suggest biological and perhaps cultural boundaries. Thus, biological distance can be used more fully to understand mating networks between these communities.

This argument does not imply that emic perspectives of differences in ethnicity or other forms of cultural identity necessarily confer biological realities (Albers and James 1986; Barth 1969; Jones 2002). Nor does it suggest that biologically distinct communities did not interact on a sociopolitical level. Obviously, multiple lines of evidence must be used to address the temporal and regional debates outlined above. Rather, population distances can address more

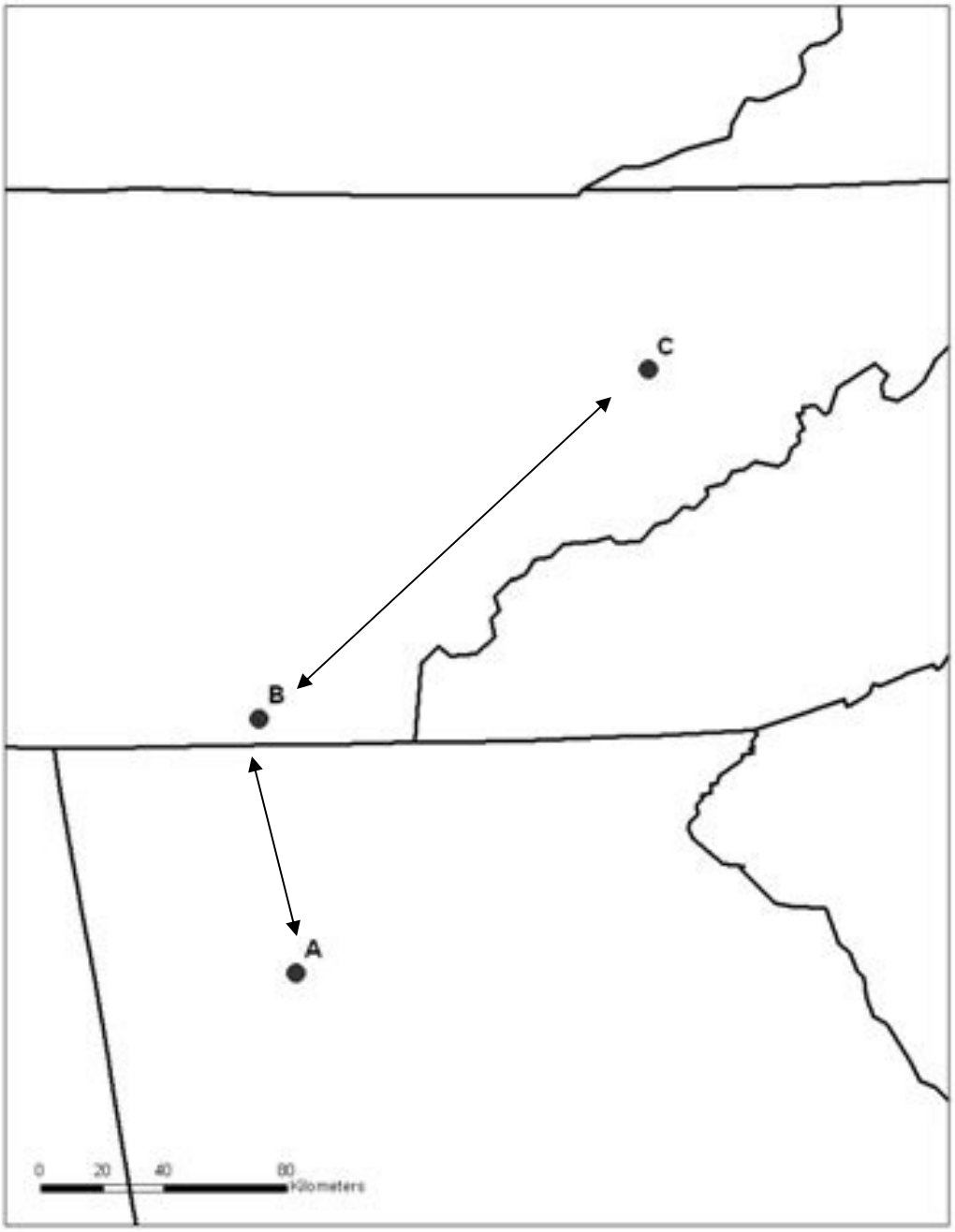


Figure 1-2: Biological Distance Example: Where A represents a North Georgia Barnett Phase Site and B and C represent East Tennessee Dallas Phase Sites.

fully what part, if any, biology and marriage alliances played in the construction of cultural identities and chiefly alliances within this region at the eve of and during Spanish contact.

In order to address the goals of this study, several lines of investigation are employed. First, interregional biological variation is assessed via biological distance measures, through a "model-bound" population perspective for the six site samples. These biological distances are then compared to geographical distance measures. These data can then be used as a starting point to discuss patterns of population genetic history and biological interactions. The findings are then compared to material cultural traits in order to reveal the process of cultural identity construction in the study region.

Second, intra-site biological variation is also considered in order to understand more thoroughly the similarities and differences in the internal structure of these individual communities. While Mississippian societies are generally described as matrilineal, there is a question as to whether researchers should automatically assume matrilocal residence patterns across time and space throughout all segments of a population. For this reason, biological distance matrices are calculated by sex in order to examine postmarital residential patterning in the study region. Of relevance to note here is that DNA and bone chemistry analyses could not be employed in this research in deference to the wishes against destructive analysis by Native tribes.

Organization of the Chapters

The subsequent chapters detail the archaeological, ethnohistorical, and methodological background of the study. Chapter Two outlines the archaeological setting and presents an

overview of the archaeological sites. While the Coosa chiefdom is briefly discussed in these introductory remarks, Chapter Two also provides a greater ethnohistorical and archaeological perspective of Coosa as well as a brief discussion of the ethnohistory of historic tribes within the region. Chapter Three details the sites used in the study and presents comparisons of mortuary data. Chapter Four covers the methodological background of the biological distance analysis and discusses previous, relevant biological distance studies. Chapter Five describes the samples and methodology. Chapter Six discusses the results and the implications for prehistoric interactions in the region. Chapter Seven offers a summary of findings, suggestions for further work, and concluding remarks.

Chapter II: Archaeological and Ethnohistorical Setting

Biological indicators are one means of exploring social and political interaction and integration, but a stronger case can be built by using a multidimensional approach. Theoretical underpinnings, material culture, and ethnohistorical data also are relevant for interpreting social and political interaction and integration during late prehistory in the Southern Appalachian region. By political and social integration, I refer to Blitz and Lorenz's (2006:7) definition of political integration as "the establishment of polities and political territories" and social integration as "the formation and maintenance of a collective social identity that defined an affiliation shared by multiple kin-groups."

The characterization of late prehistoric societies as chiefdoms often is the starting point for discussions regarding political integration within the Mississippian region writ large. This chapter thus begins with a brief discussion about the development and evolution of the chiefdom model, followed by an examination of how the chiefdom model fits within the definition of Mississippian societies and how researchers' views regarding the applicability of this model have changed. The final part of the chapter is an overview of the cultural histories of the regions represented in the study. This overview highlights similarities and differences in historical trajectories and material culture. Perhaps the most enduring model when it comes to political and social integration in the study region is the Coosa chiefdom reconstruction. For this reason, further consideration of the ethnohistoric and archaeological evidence for the Coosa chiefdom is in order. While Cherokee origins are not central to this study, a brief discussion about the

Cherokees illuminates the long-term trajectories that were set into motion during the study period.

Defining the Chiefdom Model

The chiefdom model is deeply entrenched in a stage-level neoevolutionary perspective. This perspective was (and some would argue still is) influential in the way chiefdom societies are viewed and studied by archaeologists (Yoffee 1993). From the perspective of neoevolutionary theory, chiefdoms mark a bridge between predominantly egalitarian societies and bureaucratic, state level societies (Fried 1967; Service 1971). The defining features of the chiefdom model derive largely on research conducted in Polynesia during the 1950s and 1960s (e.g., Goldman 1955; Sahlins 1963; Service 1971). Neoevoltionary models, with their materialist bent, were likely popular among archaeologists because of the ease in identifying archaeological correlates (c.f., Peebles and Kus 1977). The original definition of chiefdoms was based on both economic (redistribution and centralization) (e.g., Service 1971) and sociopolitical (ascribed ranked societies) (e.g., Fried 1967) factors.

Service (1971:134) defined chiefdoms as "redistributional societies with a permanent central agency of coordination." His argument focused on the notion of a "redistributive hierarchy" that acts to integrate ecologically specialized community economies within a larger polity. Centralization and the redistribution of significant resources were thus key components in defining the chiefdom model. Redistribution as a defining element of chiefdoms is a contentious aspect of Service's thesis. Today, a redistributional economy is no longer a widely accepted criterion of chiefdoms. In subsistence-based economies, both ethnographic and

archaeological research demonstrates that most communities appear to be economically self-sufficient (Earle 1977; Peebles and Kus 1977; Wright 1984).

Because of the lack of archaeological or ethnographic evidence for redistribution, tribute mobilization has replaced redistribution as an important defining characteristic of chiefdoms (Earle 1977). The importance of tribute mobilization and its connection with surplus production was recognized earlier by Sahlins (1963) who discussed the *noblesse oblige* in Polynesian societies. The concept was further elaborated by other investigators using both ethnohistorical and archaeological data (e.g., Earle 1977, 1987; Pauketat 1997; Peebles and Kus 1977; Welch 1991, 1996). To these researchers, surplus production not only provided subsistence needs to elites, but also fueled the prestige goods and exchange networks that were used to legitimize elite power and authority.

Unlike redistribution, centralization remains a key component in the chiefdom model. In fact, centrality of regional organization is one of the most often cited attributes of chiefdom societies (Anderson 1994, 1996; Earle 1987; Steponaitis 1978). For example, some complex hunter/gather communities have social inequality and tribute mobilization (e.g., Northwest Native Americans and potlatches), but their lack of regional organization makes researchers reluctant to describe them as chiefdoms. Chiefdoms are often defined as multi-community political units with a primary center from which centralized power is distributed over distinct villages, hamlets, or subsidiary communities (Anderson 1994). The size and power of chiefdoms are often measured by the number of communities under direct or indirect control of the primary center (Steponiatis 1978).

The internal sociopolitical structure of chiefdoms is characterized as ranked societies with essentially two social strata -chiefly elites and commoners - with some sort of hereditary bases for this ranking (Fried 1967). Differences in privileges, duties, and authority between these two strata can vary considerably and appear to be scale dependent, based on the polity size and organizational complexity of a given society (Feinman and Neitzel 1984).

For some scholars the apparent reduction of societies into mere checklists is viewed as counterproductive because it masks variation between and among societies (Pauketat 2007; Yoffee 2005). Furthermore, Yoffee (1993) suggests that rather than archaeologists developing their own theories based on archaeological data, archaeologists have depended too heavily on theories born out of ethnographic data. He writes, "No processes of long-term changes in the past can be adequately modeled on the basis of short-term observations in the present" (Yoffee 1993:63). The transition from studying simple and arbitrary cultural evolutionary stage definitions to explanations of the dynamism and variation within prehistoric societies is resulting in new interpretations and ideas about social and political integration and interaction. The prehistoric Southeast (and the Mississippian Period in particular) is taking center stage in defining the mechanisms of chiefdom societies over earlier Oceanic models (Yoffee et al. 1999). Some of these new ideas have been specifically developed and informed by Mississippian Period research.

Defining the Mississippian Period

Similar to the concept of the chiefdom, the definition of "Mississippian" has evolved over the last several decades. The concept that initially developed as part of a taxonomic-

nomenclatural system has expanded to include inferences regarding sociopolitical organization and shared ideology. This expanded definition inevitably has led to a preoccupation among archaeologists regarding the process of "Mississippianization" (and by extension the development of sociopolitical complexity), the sources of sociopolitical complexity, and, most pertinent to this study, the degree of sociopolitical integration among regions and sub-regions.

As originally conceived, the term Mississippian expanded from a pottery style (Holmes 1903) to encompass an archaeological tradition that includes a select trait list of material and architectural attributes within the southeastern and part of the Midwestern United States (Griffin 1967). These attributes include shell-tempered pottery, wall-trench houses, and earthen platform mounds (with usually an associated structure, charnel house, elite residence, elite burial population, or public ceremonial center) (Griffin 1967; Steponaitis 1986). Most Mississippian towns tend to follow a general plan (c.f., Lewis and Stout 1998) consisting of a residential areas centered around a platform mound and plaza area. These plazas and mounds represented the focal point of communal and ritual activities. Defensive structures, usually in the form of wooden palisades, often surrounded the towns. Developmentally, these cultural manifestations appear between AD 700 - AD 900 and end around AD 1600 – 1700 (Griffin 1985:63), although the appearance of these traits and the rise and decline of these communities in general varies regionally.

Archaeologists have further expanded the list of Mississippian attributes to encompass socioeconomic characteristics. For instance, importance of a maize-based economy is a significant development during the Mississippian Period. Although maize was introduced to the

Southeast during the preceding Woodland period, the dependence on maize as a staple crop in most localities is one of the Mississippian Period's defining characteristics (Steponaitis 1986).

Yet, it has been social political complexity and the characterization of these archaeological sites as manifestations of chiefdom level societies that has dominated Mississippian discourse over the last several decades. In fact, Anderson's (1994:111) definition of Mississippian societies as "multicommunity polities characterized by one or two decision-making levels above the local community and administered by hereditary elites" is virtually indistinguishable from the definition of chiefdoms.

Many of the significant attributes that unify the Mississippian Period are used as evidence of a chiefdom level organization. For instance, the dependence on a maize-based economy allowed for the surplus that could be used for elite-based social and political purposes (Muller 1997; Pauketat 2004:103). In some areas, the general settlement patterning also appears to conform to the chiefdom model with multiple communities, consisting of civic ceremonial centers (multi-mound and village complexes), smaller single mound villages, and farmsteads or hamlets, in well-defined territories (Hally 1993). Internal site differentiation of household sizes, burial segregation, and the inclusion of the quality and quantity of funerary objects at some sites also is evoked as evidence for internal ranking of village inhabitants (Brown 1981; Hatch 1974; Pauketat 2004; Peebles 1971; Peebles and Kus 1977). Within the demographic structure of burial populations, there is an expectation of a pyramidal structure of membership in which a progressively smaller number of individuals held progressively higher social positions. These social ranks tend to crosscut age and sex (i.e., ascribed status) (Peebles and Kus 1977). Although this patterning should be interpreted with caution, the inclusion of children within the most elite

group at many Mississippian sites is used to suggest ascribed status (Brown 1981; Peebles and Kus 1977, but see Brown 1995).

Another important attribute of the Mississippian Period that is used as a centerpiece of discussions about regional sociopolitical interaction and sources of elite power is the presence of a suite of exotic goods referred to as the Southeastern Ceremonial Complex (SECC). SECC refers to similar recurring sets of themes, motifs, and iconography implemented on an array of media, especially shell and copper. Knight (1986) argues that recurring themes suggest a unified set of ideals during the Mississippian Period. Yet, the regional and temporal variation of motifs (Brown 1989; Knight 2006; Muller 1989) is contrary to the SECC representing a unified "cult" as originally defined by Waring and Holder (1945). For example, the birdman figure ubiquitous within the North Georgia and East Tennessee region are absent at Moundville where motifs such as the weeping eye predominate. Within the Valley and Ridge region in particular motifs vary temporally from what Muller (1989) defines as the Hightower style (e.g., "turkey cock", "spider", anthropomorphic "Big Toco") which dominate earlier Mississippian assemblages to the shell masks and "Citico" and "Lick Creek" snake gorgets that dominate later Mississippian assemblages.

While the meaning of different symbolic representations is the focus of considerable research, the exchange networks represented by the distribution of SECC object and the presence of these objects in funerary contexts (and by proxy as symbols of sociopolitical integration and complexity) also has been an important research topic. Some archaeologists suggest that the association of SECC items with elites in general is evidence that elite or chiefly authority was more ideological than economic (Cobb 2003). The large network of shell gorget exchange is

often cited as evidence for the importance of a prestige goods-based economy for Mississippian chiefdoms (Trubitt 2000).

A great deal of research has focused on the degree of political complexity that Mississippian communities represented (c.f., Cobb 2003). Mississippian societies are typically categorized as *simple, complex*, and *paramount* chiefdoms. Simple chiefdoms are defined as chiefdoms that represent one level of decision-making authority above the local community, usually represented by single mounds, and marked by two social classes: elites and commoners. Complex chiefdoms represent decision-making authority two or more levels above the local community and usually represented by multi-mound and single mound configurations that consist of higher-level elites, lower level elites and commoners. Paramount chiefdoms are large, centralized chiefdoms with direct control of at least one other complex chiefdom (Steponaitis 1978, Anderson 1996) (Figure 2-1). As Cobb states, (2003:67) "paramount chiefdoms are best viewed as loose and unstable confederations owing to the uncertain power held by their leaders."

The existence of paramount chiefdoms appears to be a rare occurrence within the Mississippian archaeological record, with *perhaps* the large sites of Cahokia, Moundville, and Etowah being the most likely examples (Blitz 2008; King 2003, 2004; Knight and Steponaitis 1998; Pauketat 2004) (though it should be noted that while Pauketat (2007) rejects neoevolutionary typologies, he views the magnitude and influence of Cahokia as something akin to a state level society). In the Valley and Ridge province of eastern Tennessee and northern Georgia, the discussion of paramount chiefdoms inevitability turns to the Coosa political entity as reported by sixteenth-century Spanish explorers. Yet, the discussion of Coosa as a paramount

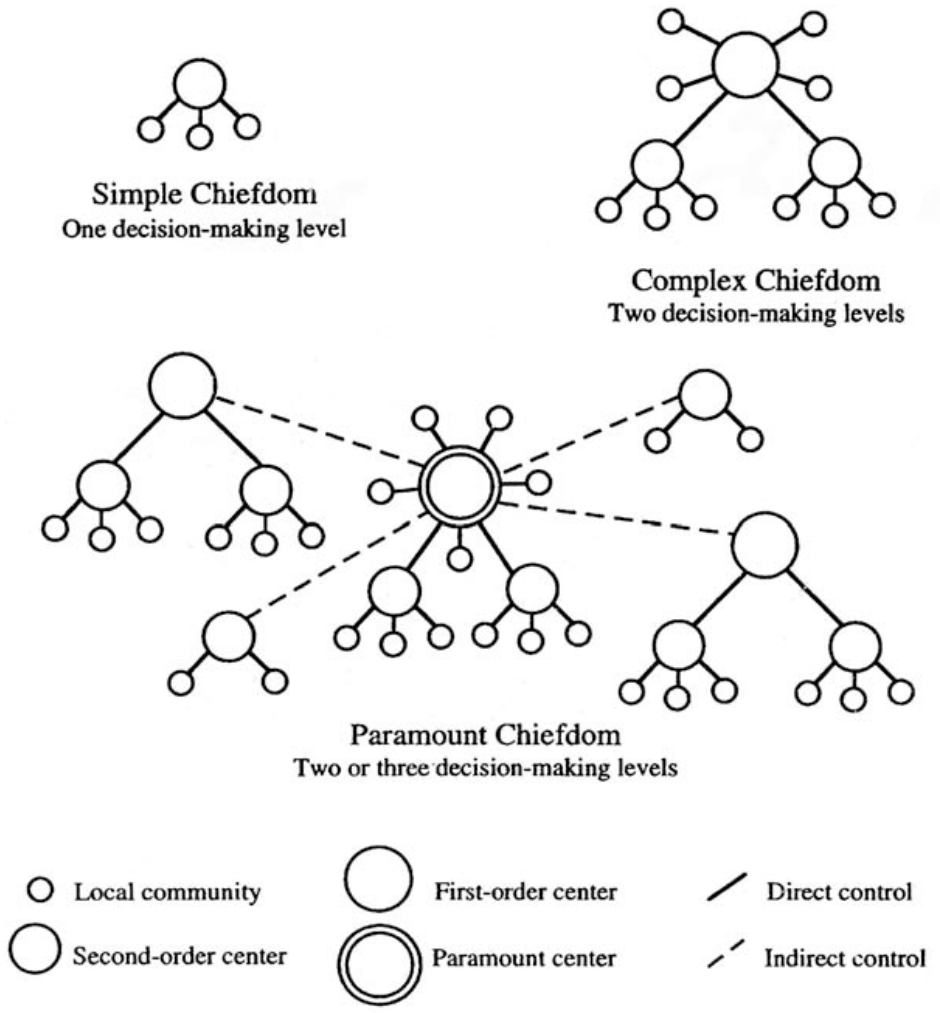


Figure 2-1: Schematic Representing the Proposed Organization of Chiefdoms and Hierarchy of Control from Anderson 1996.

chiefdom is heavily based on the Spanish accounts, with little direct archaeological evidence of its existence.

Inferences regarding Mississippian regional organization are largely influenced by Hally's (1996) work on the spatial arrangements of mound centers. Hally suggests that mound centers spaced approximately 18 kilometers apart were part of the same polity, whereas those spaced further than 32 kilometer intervals represent separate polities. Developing these types of site-size hierarchies is of course dependent on fine chronological control that demonstrates that these mound complexes were occupied contemporaneously. Refined cultural chronologies demonstrate that many of these mound centers were occupied consecutively and that some were abandoned at times and/or went through periods of dramatic sociopolitical restructuring (Anderson 1994; Blitz 1999; Blitz and Lorenz 2006; King 2003; Knight and Steponaitis 1998; Sullivan 1986).

On a more theoretical level, some Mississippian Period investigators reject the simple-complex-paramount chiefdom scheme as too typological and have turned their attention to the processes responsible for the creation and maintenance of polities. Many scholars are focusing on topics such as factional competition, environmental factors, regional alliances, prestige good economies, the need for security, and whether chiefly authority was based more on sacred authority or secular authority (c.f., Anderson 1994, 1996; Beck 2003; Blitz 1999; King 2003; Welch 2006).

Two such examples are the "cycling" and "fission-fussion" model. Anderson's (1994, 1996) chiefly cycling model was pervasive in many discussions and visualization of Mississippian political interactions. Proposed by Wright (1984) for Mesoamerica and

Mesopotamia, Anderson (1994, 1996) co-opted the cycling model and applied it to Mississippian chiefdoms. Anderson argues that cycling occurs when chiefdoms "cycle" between one and two decision-making levels above the local community. Briefly stated, Anderson's visualizes cycling as: regional consolidation of smaller chiefdoms, expansion, overexpansion, and fragmentation back into simple chiefdom configurations. Anderson examines site clusters of single and multimound complexes as well as artifact distributions in the Savannah River Valley in order to lend support to his argument. The chiefly cycling model was born out of conflict theory in that cycling is a form of conflict resolution. Anderson gives several considerations of why cycling can occur, but he argues that single most driving force of cycling is factional competition.

Blitz (1999) argues that the cycling model cannot encompass all of the variation within Mississippian settlement data, for instance, the presence of isolated multi-mound sites with no single-mound antecedents or paired single mound sites. In fact, he argues that a reexamination of chronological data in the Savannah River Valley as well as settlement data from Northern Georgia suggests that multimound paired with outlying single mound sites were rare in these areas. This also is true for East Tennessee. Rather isolated or paired single mound sites are the most common. Blitz also argues that the cycling model's focus on top-down hierarchal configurations ignore the possibility for horizontal regional alliances. Blitz's fission-fussion model suggest that autonomous sites fission and fusion as needed because of simultaneous, if not conflicting, desires for both protection and autonomy. Unlike, the cycling model, the fission-fussion model is a goal oriented approach in that its changes in configurations are brought about

by the needs and goals of the local inhabitants. Both the cycling and fission-fussion model have highlighted the instability of such regional interactions.

Beck (2003) also argues that typological approaches such as the simple-complex chiefdom concept is uninformative as to the how and whys of chiefdom development and evolution. In this vein, he proposes a constituent-apical model in which a social condition (e.g. agricultural surplus) leads to a process of regional consolidation. The manifestation of this consolidation can lead to two outcomes depending on restricted or open mobility: apical or constituent hierarchies. Apical hierarchies are more coercive in nature and based on group distancing behavior where power tends to be top-down and given to local centers. Within an apical configuration, esoteric knowledge is restricted. Constituent hierarchies are based more on appeal to sacred authority rather than coercive, and power is usually ceded upwards. Constituent societies are generally marked by group building strategies (e.g., mound building activities) and esoteric knowledge is more open. Beck's model is very similar to Blanton and coworker's (1995) duel processual model and their discussion on network versus corporate strategies that has been used by a range of researchers including King (2003) for Etowah. Both models have the potential to be reduced to a mere set of trait lists and thus failed to transcend the typologies that Beck has argued against (Pauketat 2007). Furthermore, it is possible for the simultaneous existence of both apical and constituent strategies operating within a single community.

Other scholars have moved beyond the top-down approach of focusing on elites to investigations of more crosscutting social segments, such as gender (Rodning 2001; Sullivan 2001, 2006) and kin-based groups (Boudreaux 2007; Cook 2007; Wilson 2007) and their importance in the construction of Mississippian societies. This emphasis is providing a greater

understanding of the agency of non-elites in structuring sociopolitical interactions within Mississippian societies.

A growing body of literature involving detailed site synthesis and more fine-grained regional overviews (e.g., Blitz and Lorenz 2006; Bourdeux 2007; Hammerstedt 2005; Hally 2008; King 2003; Rodning 2004; Sullivan et al., 2009; Wilson 2007) is underscoring distinct regional and temporal differences in historical trajectories and organization within the Mississippian Period. This work has in part informed arguments regarding the applicability of the chiefdom model to all Mississippian groups (Pauketat 2007). To Pauketat (2007:81) the concept of chiefdom and associated models such as "cycling" among other models (Beck 2003, King 2003), with its neoevolutionary baggage and its own set of trait lists, constrains archaeological thinking since it implies "cultural homogeneity and uniform political structure rather than a plurality and diversity of organizations, identities, and historical experiences." In light of the new work stressing Mississippian variability, the examination of the creation and maintenance of cultural identity offers a particularly promising avenue of research.

The multitude of research on Mississippian societies clearly indicates that Mississippian lifeways varied regionally and temporally. The term Mississippian, similar to the concept of chiefdoms, is simply a means of drawing broad comparisons among communities with certain shared characteristics. Yet, it is the internal dynamics and regional variants that are also of interest to researchers. In this respect, Campbell (2009:825) asks some salient questions,

> "Should we speak of a polity idea or polity ideas? Among which segments of society were these senses of community salient? If there are generally multiple networks of

power and boundaries of identity, how might these relate to one another? To what degree might these identities be consolidated within an overarching political identity?"

The full exploration of these regional variations and the internal workings within them will only serve to broaden our understanding of prehistoric Mississippians. These internal dynamics and regional variants also are of critical importance since they have direct implications as to the "lived experiences" of individual community members.

The Mississippian Period in East Tennessee

Four Phases divide the Mississippian Period in East Tennessee: the Martin Farm Phase, the Hiwassee Island Phase, and the Late Mississippian Dallas and Mouse Creek Phases (Table 1-2). First proposed by Salo (1969), the definition of the Martin Farm Phase (A.D. 900-1000) was an important step toward understanding Mississippian expansion in eastern Tennessee (Schroedl 1998). Martin Farm represents the transition between Late Woodland and fully developed Mississippian lifeways. A mixture of Late Woodland and Mississippian pottery attributes marks Martin Farm material culture. Limestone tempering, characteristic of the Late Woodland Period, is used in plain and cordmarked pottery, but also in Mississippian-style loop handles and jar forms. Some shell-tempered pottery also is present (Kimball and Baden 1985; Schroedl et al. 1990). There is generally no increase in site size during the Martin Farm Phase; village sites generally consist of ten to twenty residences perhaps surrounding a small open space, and small platform mounds were sometimes built over leveled buildings. Burials are not associated with

the villages. In fact, mortuary patterning changes little from the preceding Late Woodland Period in East Tennessee. Martin Farm Phase burials appear generally confined to conical burial mounds known as Hamilton Mounds (Lewis and Kneberg 1946).

An underlying argument during the 1930s-1960s regarding Mississippian development in East Tennessee was that Mississippian lifeways resulted from a migration of ancestral Creek into the area (Schroedl 1998). The analysis of sites such as the Martin Farm (40MR20) type-site, other Martin Farm sites within the Tellico reservoir, as well the Mouse Creeks (40MN3), Hiwassee Island (40MG31), Hixon (40HA3), Davis (40HA2) and Lea Farm (40AN17) sites (Chapman 1994; Schroedl 1998, Sullivan 1995) demonstrated that Mississippian societies in East Tennessee were in-situ developments, not the result of migration.

The Hiwassee Island Phase (AD 1000-1300), first proposed by Lewis and Kneberg with their work in the Chickamauga Basin, represents the classically defined Mississippian development. The Hiwassee Island Phase, as originally proposed by Lewis and Kneberg, is characterized by shell-tempered pottery, wall-trench buildings, and loop handled pottery and flared rim jar construction. The phase is marked by a more formal village construction with a centralized plaza and community buildings and the presence of a palisade at some sites (Schroedl 1998). The villages themselves possibly represent population growth or consolidation from the earlier Martin Farm Phase.

Platform mound construction is present at sites such as the Hiwassee Island type-site and the earlier occupation at Toqua (40MR6) in the Tellico Reservoir. Other sites such as Davis and Hixon in the Chickamauga Basin and Leuty (40RH6) in the Watts Bar reservoir area suggest that platform mounds were constructed away from the village locations (Lewis et al. 1995; Schroedl

1977). Similar to the Martin Farm Phase, no village interments have been found directly associated with the Hiwassee Island village occupation (AD 1000-1200), and very few with associated platform mounds (Boyd and Schroedl 1987; Lewis et al. 1995). Again, burials seem confined mostly to conical burial mounds, with radiocarbon dates and rare Mississippian burial inclusions as the only distinguishing factors between Hiwassee Island interments and Late Woodland interment.

During the later Hiwassee Island Phase (AD1200-1300), greater quantities of burials are associated with the platform mounds. At the Hiwassee Island-Dallas (approximately AD1200 – 1350) Hixon site, the interments themselves also became much more elaborate, with a greater quantity of funerary objects and the appearance of SECC items (Sullivan 2007; Sullivan and Humpf 2001). It has been previously proposed that based on shared iconography, overlaps in pottery styles, and the timing of changes in mortuary patterning at Hixon, the Hixon site was part of a regional alliance that extended into northern Georgia and especially with the large Etowah site (Cobb and King 2005; Sullivan 2007; Sullivan and Humpf 2001).

Lewis and Kneberg also first proposed the succeeding "Dallas Culture" largely based on their work in the Chickamauga Basin. As defined by Lewis and Kneberg, attributes of the Dallas focus (now phase) included the presence of single-set large log structures (as opposed to those of wall-trench construction in the preceding Hiwassee Island Phase), predominantly flexed burials interred both within residential areas and mounds, artifacts including triangular projectile points, shell gorgets, shell vessels and ear pins, repoussee copper work, and strap-handled jars and pottery with an increase in decoration (Lewis and Kneberg 1946; Lewis at al 1995).

Significant site structure changes take place within Dallas towns as compared with the preceding Hiwassee Island Phase. Towns become larger and are marked by significant population growth (Schroedl 1998). The most significant change from Hiwassee Island to the Dallas Phase is the use of both public and private spaces for interments. Schroedl (1998) argues this might suggest a change in social organization in which control of esoteric knowledge and sacred space had become increasingly limited. Sullivan (2001, 2006) argues that this in some ways represents more heterarchical notions of power. She proposes that at the Dallas and Toqua sites the pattern of a greater number of males interred within the platform mound while older adult females associated with village interments and differences in the quantity and quality of grave goods indicate differential sources of power or authority for males and females. Women's power was vested in the domestic sphere and men's within the public sphere. Deviations from this mortuary program described by Sullivan and Harle (2010) at more northern sites in East Tennessee and North Georgia sites suggest intriguing differences in the construction of gender and these will be further elaborated on in the following chapter.

Internal dynamics and regional alliances have remained underdeveloped areas of research among Dallas sites. Hatch's (1974) regional study on mortuary ritual among Dallas Phase sites remains influential as to inter- and intra- sociopolitical organization of Dallas sites. Operating within the Saxe-Binford approach (c.f., Brown 1995) in which mortuary variability can be used to study levels of social organization, Hatch ranked several sites by relative social complexity with sites such as Citico (40HA65) and Hixon at the high end of the sociopolitical complexity spectrum and sites such as DeArmond (40RE12) and Fains Island at the lower end. If theoretical arguments regarding his analysis are put aside, several issues remain. One is still left wondering

how the sociopolitical differences that Hatch observes within the mortuary program are manifested by social and political integration and interaction. Further, perhaps the most difficult issue to overcome in Hatch's analysis is chronology. Progress in regional and temporal refinement now demonstrates that the use span of Dallas sites varied (Harle 2003; Sullivan 2007, 2009). Some of the sites used in Hatch's analysis are not contemporary or were occupied sequentially and not contemporaneously. Mortuary differences observed by Hatch may actually be the result of temporal differences not relative socio-political differences.

While several studies have further examined internal sociopolitical makeup within sites (e.g., Sullivan 1986, 2001; 2006; Scott and Polhemus 1987), very few studies have examined the regional political economy and integration among sites. Part of the problem has been that, although there are thirty-three known Dallas mound sites (Schroedl 1998), many of these sites were destroyed before systematic excavation, and collections from many more remain inadequately analyzed. Furthermore, investigators are still working out the fine chronological resolution achieved in other Mississippian regions (Sullivan 2007, 2009; Sullivan et al. 2009). There are a few exceptions. Meyers (2006) uses several mound clusters in northeastern Tennessee and southwestern Virginia to construct polities within that region. She suggests there were three main administrative centers (one centered along the Clinch River, one on the Powell River, and one located on the Holston, Nolichucky, and French Broad Rivers. Recently obtained radiocarbon dates suggest that several of the sites used in her analysis were not occupied contemporaneously (Sullivan et al. 2009). Of course, the most enduring argument regarding the political integration of Dallas sites has been the Coosa paramountcy, a point to which I will return.

The Mouse Creek Phase (AD1400-1600) seems to be generally restricted to the lower Hiwassee River and adjacent portions of the Tennessee River. Excavations in the Chickamauga Basin produced four sites with Mouse Creek components: Rymer (40BY11), Ledford Island (40BY13), Mouse Creek (40MN3), and Ocoee (40PK1). One Mouse Creek has site been identified outside the Chickamauga Reservoir; the Upper Hampton site (40RH41) located in the Watts Bar Reservoir contains Late Woodland, Hiwassee Island, Dallas, Mouse Creek, and protohistoric components. The Moccasin Bend site in Chattanooga also is suggested to belong to the Mouse Creek Phase, but this assignment has not been demonstrated (McCollough and Bass 1983).

Mouse Creek sites also consist of a formal village arrangement with a central plaza and an associated ceremonial structure. Unlike Dallas sites, there is no evidence for mound building activities during the Mouse Creek Phase. The majority of both later Dallas occupations and Mouse Creek ceramic assemblages are dominated by shell-tempered pottery. Dallas pottery includes more cordmarking than do Mouse Creek Phase ceramics and most Mouse Creek Phase saltpans are plain as opposed to the textile-impressed Dallas pans (Kimball and Baden 1985; Lewis and Kneberg 1946).

Some disagreement exists regarding just what the Mouse Creek Phase represents. Lewis and Kneberg (1946; Kneberg 1952) noted similarities between Mouse Creek and Middle Cumberland sites (located in Middle Tennessee) and suggested more of a connection between the two than between Mouse Creek and Dallas sites. Current material cultural studies fail to confirm this relationship (Kimbal and Baden 1985). This question has also been addressed with biological analyses and is discussed in Chapter Four. Garrow (1975) suggested that Mouse

Creek sites represent "frontier towns" associated with Barnett Phase sites, though differences in material cultural do not appear to confirm this argument. Schroedl (1998) suggests that the Mouse Creek Phase is an intermediate stage between the more hierarchal Dallas Phase and the more egalitarian protohistoric Cherokee. Some researchers suggest that the Mouse Creeks sites which, based on radiocarbon dating, appear to be a sequential occupation to Dallas sites in the Chickamauga Basin, may be the result of such reorganization (Sullivan 1986; 2007; Schroedl 1986). Based on mortuary practices, Mouse Creek communities appear to be more egalitarian than observed at some Dallas sites, with the disappearance of an identifiable elite structure (Sullivan 1986). The abandonment of mound construction may suggest that "the network of chiefly elites could no longer extract, obtain, or control the resources necessary for its existence and it became progressively more difficult to maintain a political and religious hierarchy" (Schroedl 1986:130). Sullivan (1995) argues that Mouse Creek could represent cultural variants that existed during the same time as later Dallas cultures, and were thus marked by different developmental trajectories.

The Mississippian Period in North Georgia

The beginning of the Mississippian Period in northwestern Georgia (specifically the Coosa, Etowah, and Oostanaula River drainages) is divided into the Woodstock Phase (AD 900-1050) and the Etowah Phase (AD 1050-1250) (Cobb and Garrow 1996; King 2003) (Table 1-2). The Woodstock Phase is poorly understood, but perhaps the most extensively studied is the Pott's Tract (90MU103) site, located along the Coosawattee River. The excavations located one large midden and several refuse-filled storage pits; no house structures were identified. A few

other small settlements dating to the Woodstock Phase have been identified within the same river valley. The Woodstock Phase, like the East Tennessean Martin Farm Phase, is not purely Woodland and not quite Mississippian. The appearance of fortifications around village sites is one defining feature of transitional Mississippian villages in northern Georgia. Platform mounds are rarely associated with these villages and populations appear to have been small (Smith 2000).

Not until the Etowah Phase are there true Mississippian cultural manifestations. Platform mounds appear at sites such as Sixtoe (9MU100) and Etowah (9BR1) (King 2003; Smith 2000). A large number of refuse pits associated with the Etowah Phase at the Etowah site suggests that ceremonial feasting was an important component of these mound constructions (King 2003). Funerary objects are scarce, but there is a significant change in the mortuary program: the appearance of stone box graves at sites along the Coosawattee River (Smith 2000). The appearance in southeastern Tennessee, especially at the Hiwassee Island site (Lewis and Kneberg 1946; Sullivan 2009), of nested diamond, complicated stamped pottery designs that are typical of Georgia styles, indicate interactions between these areas at this time. Hiwassee Island Complicated Stamped is the shell-tempered variant of sand-tempered, Etowah Complicated Stamped pottery.

Immediately following the Etowah Phase is the Wilbanks Phase (A.D. 1200 to A.D. 1350), in the Etowah Valley, and the Savannah Phase elsewhere in the region. The essential features of the Wilbanks Phase were first defined in the Etowah River Valley. The population and perhaps centralized authority appear to be centered at the Etowah site and this period likely represents the pinnacle of Etowah's influence (King 2003). The Wilbanks Phase also marks the height of the SECC exchange in northwestern Georgia. Along the Coosa River, the major

mound and village occupation was at Bell Field (9MU101). Little is known about the site, but the recovered pottery appears more similar to that of East Tennessee than to Etowah (Hilly and Langford 1988) McKee Island cordmarked dominates the ceramic assemblage, which also includes Dallas Filleted McKee Island Brushed and Hiwassee Island Red on Bluff. With a mix of architectural and material cultural styles that show amalgamations of both East Tennessee and the Etowah River Valley, Smith (2000:30) suggests that sites such as Bell Field within the Coosa Valley "… acted as a cultural bridge between Dallas sites and Etowah." Sherds with complicated stamping typical of Wilbanks pottery (some shell-tempered) were found at the Hixon site which dates to the Hiwassee Island and Dallas Phases and is contemporary with the Wilbanks Phase (Sullivan 2007).

The transition to the later Mississippian phases marks a population movement away from the large center at Etowah and perhaps represents a decentralization of authority. The Little Egypt (A.D.1400-1500) and Barnett (A.D. 1500-1625) Phases in the Coosawatte River Valley, and the Stamp Creek (A.D. 1375-1450) and Brewster (A.D. 1450-1520) Phases in the Etowah river valley are representative of this period within the region (Hally and Langford 1988; Smith 2000). Based on shared characteristics, these phases are subsumed under an archaeological complex termed the "Lamar Culture." The Lamar Culture is defined by distinctive pottery styles (Lamar complicated stamped and Lamar incised) that are associated with many Late Mississippian phases in Georgia and portions of Alabama, South Carolina, North Carolina, Florida, and Tennessee (Hally 1994a; Shapiro and Williams 1990).

The Little Egypt Phase is identified at only two sites: Little Egypt and 9MU7. The Little Egypt Phase is marked by subtle changes in pottery such as a general increase in grit tempering

and in complicated-stamped surface treatments (Hally and Langford 1988). The presence of SECC items also appear to decrease. The quantity of grit-tempered and complicated-stamped pottery versus shell-tempered pottery is often cited as the transitional mark between the Little Egypt Phase and the subsequent Barnett Phase. The Brewster Phase differs little from the Barnett Phase other than the higher frequency of shell-tempered, Dallas plain and incised pottery. Furthermore, according to Smith (2000), there is a population expansion in the Coosa Valley during the Barnett Phase. Several sites were occupied at this time, including the large centers at Little Egypt, Thompson, Potts Tract, and King, and the majority of the population is confined to the Coosa-Oostanaula Rivers (Smith 2000). Within the upper Coosa River valley, where the King site is located, five other Barnet Phase sites are close by. Hally (2008) argues that the area was uninhabited for a least a hundred years before these occupations.

Mound building activities also appear to decrease at this time. Sites such as Little Egypt and perhaps Nixon (9FL162) are a few exceptions (Hally 2008). Although the site had been destroyed before systematic study, Hally (2008) suggests that the Nixon site formerly located on the Coosa River was the center of the polity within this area. As in East Tennessee, there appears to be an organizational shift in Northeast Georgia during the Late Mississippian Period that may represent a decentralization of authority as opposed to the preceding Wilbanks Phase (Smith 2000).

Ethnohistorical Accounts of Coosa

In East Tennessee and North Georgia, much archaeological attention is paid to early Spanish accounts documenting the inhabitants of this region, specifically the description of the

large polity of Coosa that is argued to encompass this region. If the reconstruction of Coosa is correct, it would have been the largest, most complex chiefdom in the Southeast at the time of European contact, if not surpassing the earlier paramount chiefdoms of Cahokia, Moundville, and Etowah (Anderson 1994)

Hernando de Soto was a lieutenant in Pizzaro's army during the conquest of Peru. Not content with the riches he amassed in Peru, De Soto wished to conquer the area of *La Florida,* where previous explorers such as Ponce de Leon, Lucas Vasquez de Ayllon, and Panfilo de Narvaez had failed (Hudson 1997). The goal of De Soto's entrada was to recover riches in precious metals and slave labor. Furthermore, De Soto wished to penetrate the interior, a mission his predecessors failed to accomplish (Hudson 1990). In 1539, De Soto with 600 men in tow, landed on the western coast of Florida.

Three firsthand accounts are associated with De Soto's entrada: Rodrigo Ranjel, De Soto's secretary; the account of the anonymous Portuguese Gentlemen of Elvas; and the short account of Lewis Biedma, the King's factor during the expedition, who was in charge of recording the official account (Clayton, Knight, and Moore 1993). Almost a half-century later Garcilaso de la Vaga wrote an account based on interviews of members of De Soto's army (Clayton, Knight, and Moore 1993).

Taken as a whole, these accounts describe the towns or *provinces*, dwelling types, subsistence-based economies, conflicts, funerary customs, sociopolitical interactions, as well as travel time and length of stay within a particular area. During the four years of De Soto's entrada, the chronicles recount contact with a variety of provinces, which archaeologists would now describe as chiefdoms (e.g., Apalachee, Ocute, Cofitachequi, Tastaluca, and Chicca) (Figure

2-2). For the purposes of this study, the most important portion of the chroniclers' accounts is the description of one province that was named Coça (or the more commonly used anglicized Coosa).

According to the Spanish accounts, Coosa referred to not only a single town, but also the group of towns or province that was subject to the principle town of Coosa. De Soto's entrada visited eight such towns and passed by numerous unnamed towns. De Soto traversed the entire length of the Coosa province from the northernmost town of Chiaha to the southernmost town of Talisi, including the actual town of Coosa. Upon leaving the Coosa province, De Soto and his men continued their journey, eventually crossing the Mississippi River. It was here that De Soto would die of fever in 1542. His defeated men would continue to head south until they reached Mexico City later that year.

Two decades later, two other entradas, headed by Tristan de Luna in 1560 and Juan Pardo in 1566, returned to some of the same towns visited by De Soto. While the main purpose of De Soto's expedition was the search for precious metals, Luna and Pardo's expeditions were colonizing ventures.

Many ideas adopted by archaeologists about chiefly interactions in the Southeast are directly influenced from the descriptions in these Spanish accounts. The Spaniards described many of the towns they visited as preeminent towns with smaller subsidiary towns under their direct control. These larger, preeminent towns were said to be subject to the paramount town of Coosa, a configuration similar to the paramount chiefdom model.

Descriptions of the chiefs of these paramount towns are often used by archaeologists to evoke the grandeur and amount of political control of the chiefly elite. For example, Elvas

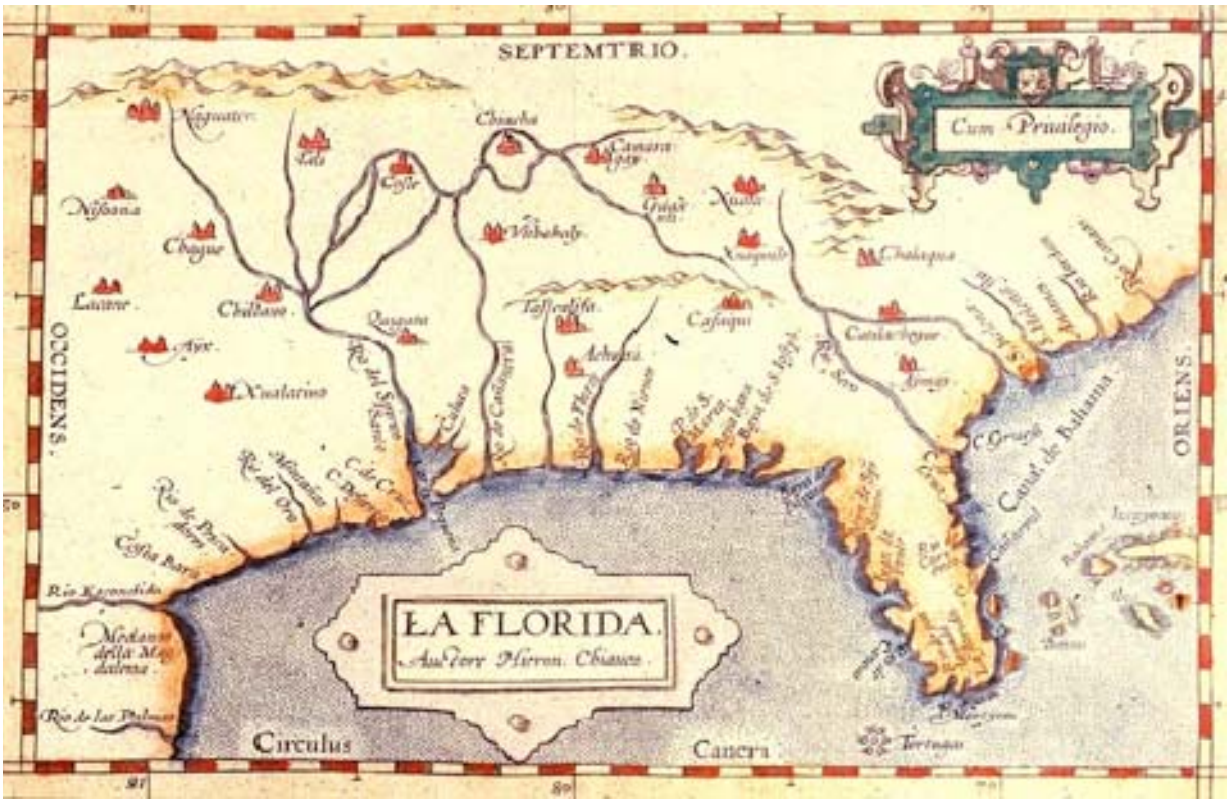


Figure 2-2: Map of the Spanish province of "La Florida" drawn by Spanish royal cartographer Geronimo Chiaves, based on accounts by members of the Hernando De Soto expedition. The map was originally published in Abraham Ortelius' Theatrum Orbis Terrarum in 1584. Source: Louisiana State Museum Map Database

(Robertson 1993:92) of-cited description of the first meeting with the chief of Coosa:

> …the cacique came out to welcome him two crossbow flights from the town in a carrying chair borne on the shoulders of his principle men, seated on a cushion, and covered with a robe of marten skins of the form and size of a woman's shawl. He wore a crown of feathers on his head; and around him were many Indians playing and singing.

Similar to the archaeological theorizing discussed previously, much of the focus on these ethnohistorical accounts is exclusively on the elite behavior. Anderson (1994) draws upon the ethnohistorical accounts of the De Soto entrada to highlight his arguments regarding factional competition as a driving force for sociopolitical change within Mississippian communities. Smith and Hally (1992) use the chronicles to reconstruct elite interactions such as greeting rituals, food provisioning, and tribute payment. To Smith and Hally the interactions among the native elites and De Soto were not entirely outside the realm of standard practices of elite behavior. For example, at Cofitachecqui and Coosa, De Soto forced the chiefs to accompany the Spaniards during some of their travels through the respective chief's lands. In contrast to Smith and Hally's argument, Waddell (2005:345) contends, "The supposed evidence of a Chiefdom, such as the compulsory collection of tribute, are documented among the Cofitachecqui and their allies only when they were required to carry out such acts by the Spanish."

Others have pointed out the limitations specifically of the De Soto accounts. Due to the timing of when the accounts were written, some accounts are less reliable than others (Boyd and Schroedl 1987; Galloway 1997). Individuals writing these accounts can put their own preconceived notions as to how a society operates onto the foreign society they are trying to document. Furthermore, even the most reliable accounts are not without interpretative difficulty,

and the interpretations written by the chroniclers may have been influenced by ethnocentrism, misunderstandings, or political agendas (Altman 1997; Galloway 1997 a, b; Hoffman 1997). For example, Hoffman contends that the descriptions of Coosa, in reference to the De Soto and Pardo expedition, served to aggrandize the expedition in regards to the former and demonstrate the futility of colonization for the latter. Thus, neither picture of Coosa painted by the expedition narratives was fully accurate, but rather informed by the larger agenda of the chronicles. Hoffman (1997:28) concludes, "The Coosa of wishful thinking, of folkloric legend developed in Mexico, was not the Coosa of the river valley of northern Alabama and northwestern Georgia either in 1541 or 1560." Given some of the above-mentioned difficulties with this type of data, it is clear that ethnohistorical accounts must be aided with a critical eye and viewed in alternate lines of evidence, including the archaeological record.

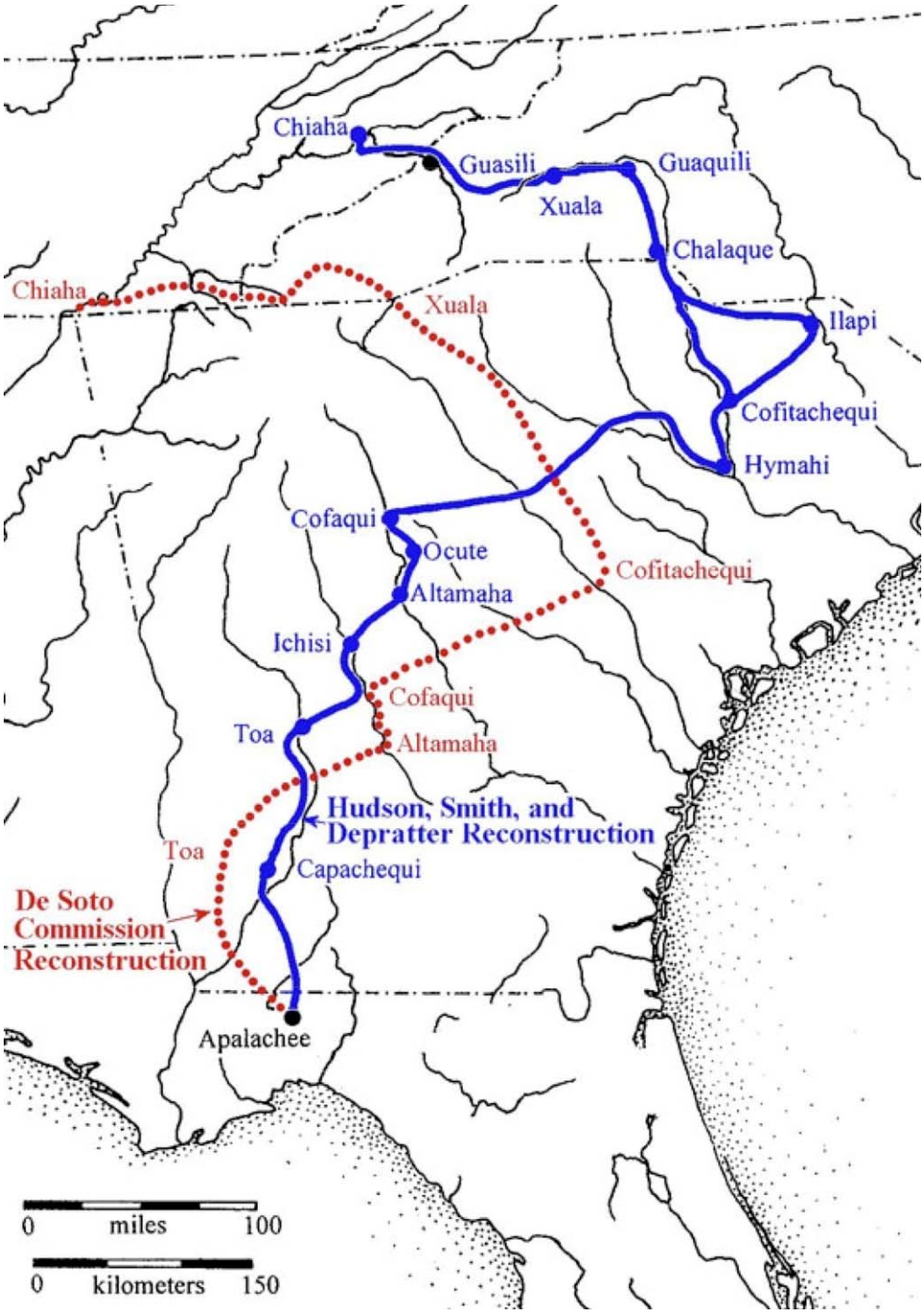
Archaeological Evidence of Coosa

Decades of research have been spent attempting to trace De Soto's exact route through the interior Southeast using ethnographic description of days traveled, topographic descriptions, and the presence of Spanish artifacts contained in particular archaeological sites. The earliest reconstruction was produced by the United States De Soto Expedition Commission in the 1930s led by ethnologist John Swanton (1939). Based on eighteenth-century accounts, Swanton placed the town of Coosa on the Coosa River in Alabama. Swanton located the northernmost town of Chiaha in Southeast Tennessee near modern day Chattanooga.

In following decades and through several articles and monographs, researchers have

suggested an alternate route for these expeditions and the location of Coosa in particular (Hudson et al. 1985; Hally et al 1990; Smith 2000). Part of the impetuous for this reanalysis was base on archaeological evidence. For example, subsequent excavations at the site Swanton proposes for the main town Coosa, on the Coosa River between the mouths of the Tallasseehatchee and Talladega Creeks, only identified an eighteenth century occupation (Hudson et al. 1985). Chronicles from the subsequent Juan Pardo expedition, namely the account of Pardo's scribe, Juan de la Bandera, which visited some of the same locales, also played a crucial role in this reanalysis. Hudson and coworkers' reconstruction places De Soto's route further north, through the Carolinas to Tennessee, before proceeding south into Georgia (Figure 2-3).

A considerable amount of energy has been invested on identifying the archaeological sites that represent the exact places visited by the De Soto entrada. Hally, Smith, and Langford (1990) identified seven possible sixteenth-century site clusters within the region that they interpret as representing the Coosa paramount chiefdom. The town of Chiaha has been suggested as located at the Zimmerman's Island (40JE2) site on the French Broad River (Beck 1997; DePratter et al. 1983; Hudson et al. 1985). Hally and coworkers (Hally et al. 1990) suggest that the administrative center at this location was associated with a Dallas Phase site cluster along the French Broad River: Henderson (40SV4), Fains Island, and McMahan mound (40SV1) sites. Other sites and site clusters identified by these scholars include: the Dallas Phase site of Bussell Island (40LD17) identified as the Spanish named town of Coste along with the Toqua (40MR6) and Citico (40MR7) sites; the Cartersville cluster including the Etowah and Leake (9BR2) sites; the Chattanooga cluster near the David Davis site that includes Citico



Creek

Figure 2-3: Map showing De Soto Commission's and Hudson et al.'s, 1985 reconstruction of De Soto's route. Image taken from Prentice 2003.

(40HA65), Audubon Acres (40HA84) and Hampton Place (40HA146); a cluster of Mouse Phase sites (Mouse Creeks (40MN3), Rymer (40BY11) Ocoee (40PK1), and Ledford Island in southeastern Tennessee; and the Barnett Phase sites near Rome, Georgia, including the King site. The Carters site cluster encompasses eight Barnett Phase sites including the Little Egypt site, interpreted by the authors as the paramount center of Coosa (Figure 2-4). If this reconstruction is correct, the Coosa paramount chiefdom's influence would have extended at least 400 kilometers in length.

Several researchers have raised critical questions regarding the Coosa reconstruction. Perhaps the most basic of these critiques is over interpretation of distance traveled. The Hudson and coworkers (1985) reconstruction is contingent on the Spanish league and how much distance was traversed by De Soto's entrada in a day. Boyd and Schroedl (1987) pose several difficulties with these interpretations, a sentiment echoed by some ethnohistorians (Hassig 1997; Weddle 1997). In response, Hudson and colleagues (1987) point to alternate lines of evidence for early Spanish explorers including the presence of sixteenth-century European artifacts (see also Smith 2000; Alexander and Trudeau 2007). However, with a large-scale trade network already in place within the region, the presence of Spanish artifacts may be the result of down-the-line trade.

Furthermore, many of the archaeological sites used in the Coosa chiefdom reconstruction lack the fine-grained temporal resolution to determine whether these sites were even occupied during the sixteenth century. For example, Zimmerman's Island often is interpreted as De Soto's Chiaha. Field workers had little time to excavate the site prior to inundation by the construction

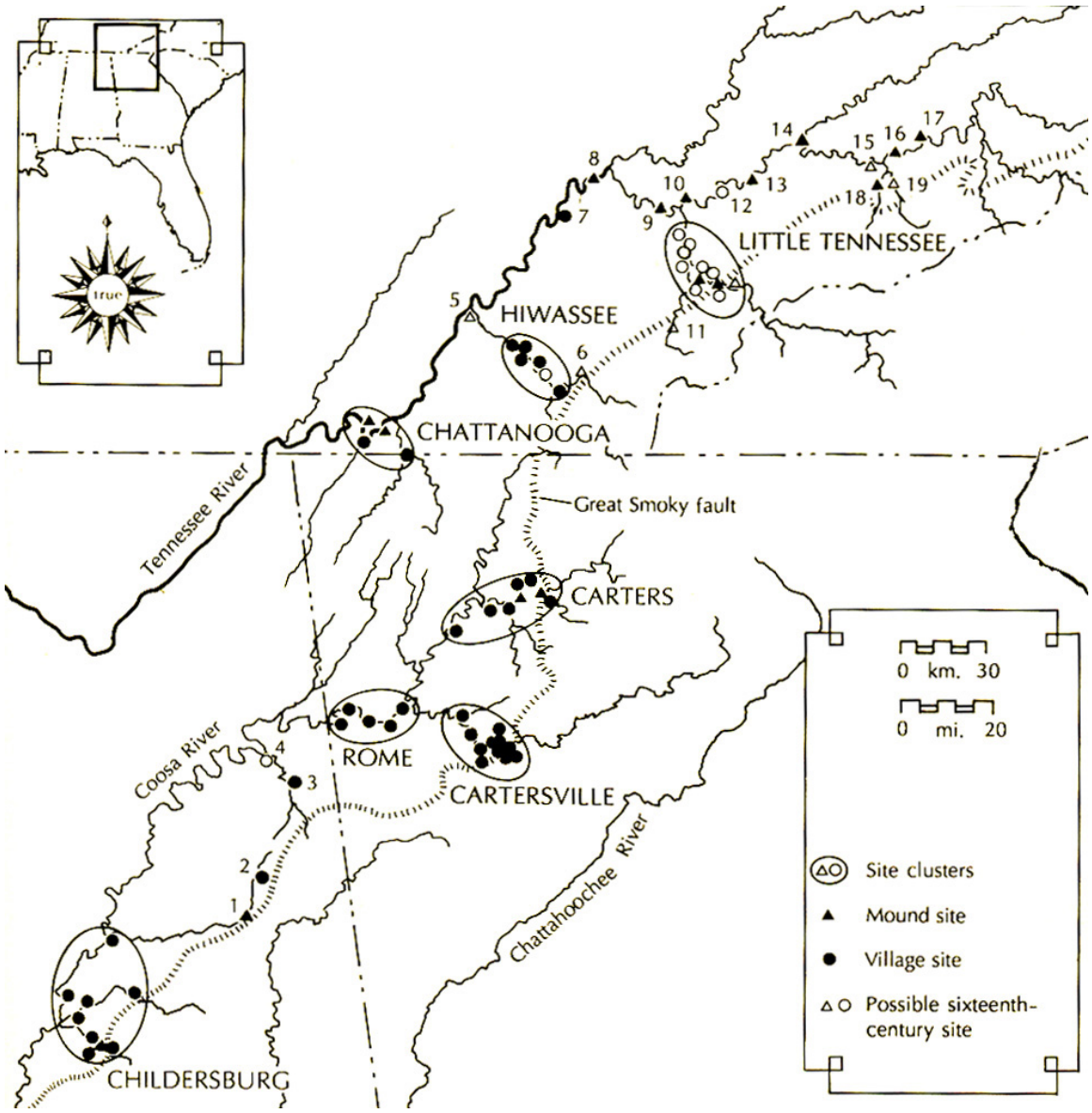


Figure 2-4: Hally and coworkers' reconstructed site clusters of the reconstructed Coosa Chiefdoms. Reprinted from Hally Smith and Langford 2005:125.

of the Douglas Dam. The site itself has never been formally analyzed and no radiocarbon dates have been obtained. It should be noted, however, that the presence of sixteenth-century Spanish artifacts along with burnt structures that have been interpreted as the remnants of Pardo's Fort San Juan, the Berry (31BK22) site in modern day Burke County, North Carolina, lend evidence for Spanish contact at least within the Catawba River Valley (Beck et al. 2006).

If we assume that Hudson and coworkers' reconstruction is correct, further questions arise regarding the nature of interactions between communities within the Coosa chiefdoms. One critique that Hudson and coworkers made of Swanton's route reconstruction is that it subsumes "a heterogeneous series of sites from several partial and entire protohistoric phases" and that "one would expect that the chiefdom of Coosa should coincide rather more neatly with the distribution of protohistoric archaeological phases" (Hudson et al. 1985:724). Yet the same can be argued for Hudson's et al. reconstruction of Coosa that incorporates Dallas, Mouse Creek, Brewster, and Barnett Phases to name a few. The above discussion about East Tennessee and northern Georgia Mississippian manifestations highlights significant differences in the material culture among these phases. Furthermore, individual site descriptions in Chapter Three further illuminate significant differences in mortuary practices among the sites in this region. These differences may suggest significant differences in sociopolitical, gender, and cultural identity constructions among these communities. The discussed sites are those from which the samples originated for the biological distance analysis that is the focus of this study.

This discussion emphasizes a significant question: if there were no ethnohistorical accounts of Coosa, could the Coosa polity be identified solely by archaeological signatures? As admitted by Hally and coworkers (1990), archaeologists have been unable to identify the Coosa

paramount chiefdom in the archaeological record. Hally and coworkers argue that this archaeological invisibility, along with the great distance that separated the paramount polities from their subordinate centers, suggests that the Coosa polity lacked a strong centralized administration, was short lived, and that subordinate centers were fairly autonomous. Seemingly, in recognition that archaeological evidence remains paltry for the centralized control of the Coosa paramount chiefdom, Hudson and coworkers (1987) suggest that rather than exerting direct control, this chiefdom most likely represented a loose alliance of sites that was inherently unstable.

What would be the archaeological correlates for a loose network of alliances? Is the chiefdom model appropriate for such an alliance? Authors of the Coosa argument suggest that Citico-style gorgets may represent a symbolic signature within the Coosa chiefdom (Hudson et al. 1985) (Figure 2-5). As Anderson (1994:154) states, "The artifact style may additionally or alternatively document the geographic extent of marital alliance networks binding the chiefdom together." Yet, the distribution of Citico style gorgets is not straightforward. Brain and Phillips (1996) argue the center of Citico style gorgets appears to be located in East Tennessee, not northern Georgia. Although, Muller (1997) does not fully agree with Brain and Phillips regarding a single center of origin, he demonstrates diminishing numbers of the gorgets from the center of sites near modern day Chattanooga. Other areas showing a positive correlation between quantity of Citico gorgets and location include sites in Virginia and near Bartow County, Georgia. The location of Little Egypt (the proposed Coosa center) did not show a statistically significant correlation.

Figure 2-5: Citico Style Gorget from the Ledford Island Site.

The distribution of ceramics also does not show clear evidence of an integrated regional alliance. The distribution of utilitarian ceramics can lead to important insights in regards to social and political integration. As Blitz and Lorenz (2006:26) state,

> "Open interaction, balanced reciprocity, and a high degree of social integration created a high frequency of shared utilitarian ceramic styles within style zones. Frontiers between ceramic style zones demarcate boundaries between groups with distinct social identities, barriers to communications that created restricted interaction, negative reciprocity, and low frequency of utilitarian ceramic styles shared between style zones."

Likewise, ethnoarchaeological data also may indicate that women signify their political alliance in the decoration of utilitarian pottery (Bauser 2000). As stated, utilitarian pottery among Dallas, Mouse Creek, Barnett, and Brewster Phases is distinctly different. Ceramic assemblages of Mouse Creek and Dallas sites are dominated by plain and cordmarked shell-tempered vessels (respectively), effigy modeled and incised decorations, and filleted rims. Barnett and Brewster Phase ceramics are dominated by grit- and sand-tempered Lamar incised and complicated stamped assemblages, carinated bowls and jars with flared rims. As with the Citico gorgets and the pottery of the earlier Mississippian phases in the study area (Etowah, Wilbanks, and Hiwassee Island), the distributions appear to provide evidence of some level of interaction between the regions. Dallas plain, incised, and cordmarked pottery can be found in North Georgia assemblages as well as Lamar complicated pottery at some sites in East Tennessee. The frequency of these pottery styles between regions seems to be low. Hally (1994) points to other similar characteristics in the study area (e.g., dependence on maize

agriculture, architectural styles, village layouts), but many of these similarities appear to be part of the larger South Appalachian Mississippian phenomena, not simply indicative of the proposed Coosa area.

The biological relationships that may reflect martial alliances within the study area are another possible correlate of social integration and interaction. Among historically-known Southeastern tribes, matrilineal exogamous clans were characteristic of their social structure (Hudson 1976). The clan structure overshadowed all other social bonds and marked an important component in structuring one's identity. Regional alliances could have been used as a means of creating cultural unity between clans and perhaps political unification between towns possibly through kinship (Knight 1990). Chapter Four returns to an expanded discussion of how biological distance studies can be used to illuminate issues concerning marital networks and postmarital residence patterns.

Afterwards: Archaeology and Ethnohistory of Historic Native Americans in the Region

Following the unsuccessful colonizing ventures by De Luna and Pardo, European contact within the study area in the interior Southeast remained unrecorded until the late seventeenth century as the British and the French encroached into the area (Crane 2004; Schroedl 2000; Timberlake 2001). These seventeenth-century European traders and explorers encountered groups that differed from the groups described in the earlier century. This new social order may have been significantly influenced by the social destabilization in the wake of earlier European

explorers and depopulation caused by the introduction of new diseases (Hudson 2002; Smith 2002, but see Kelton 2002), although this reorganization may have been a continuation of a process that had already begun prior to European exploration (Schroedl 1986, 2000).

The Overhill Cherokee were the dominant occupants of eastern Tennessee and northern Georgia. The Overhill Cherokee were centered in the Hiwassee and Little Tennessee River valleys in eastern Tennessee and constituted one of the five geographically distinct Cherokee town clusters. These Cherokee subareas shared many cultural similarities and possibly were related by matrilineal descent, but in many ways were socially and linguistically distinct (Schroedl 2000; Rodning 2002). As a whole, the Cherokee spoke a variant of the Iroquoian language group, which was linguistically distinct from their Muskogean and Catawban neighbors. Cherokee town names reflect possibly both Iroquoian (e.g., Kituwah, which is Seneca) and Muskogean (e.g., Chota, Citico, Tanasee) etymologies (Booker et al. 1992). Regarding this linguistic blend of place names, Rodning (2002:137) suggests that it may "reflect movements of people across the landscape over the course of many generations. It may even reflect negotiations and conflict between groups about access or ancestral claims to ancient mounds and towns."

Cherokee towns in East Tennessee were in many ways distinct from their earlier Mississippian counterparts. There are several significant differences in mortuary patterning and village layout between Late Mississippian Dallas and Cherokee communities (Schroedl 1986). The internal and external structure of Cherokee towns appears to be significantly more egalitarian than what is argued for the structure of Mississippian societies (Hatch 1974). Yet, the internal makeup of Cherokee towns can give some insight into the structure of earlier

Mississippian groups and the process of ethnogenesis that led to the formation of historic tribes. Cherokee towns were made up of different exogamous matrilineal clans (Knight 1990). In other words, clan identity was traced through the mother's lines and there were strict sanctions against marriage within one's clan. These clans (not towns) were the most important factor in the formation of individual social identity, and clan systems served to tie individuals to different towns. As a result, Rodning (2002) contends that many towns could have been made up of distinct ethnic groups by virtue of fictive or adoptive membership in clans or by acceptance of certain clans into communities.

The origin and formation of the Cherokee and their relationship with earlier Mississippian populations in the study area has been a preoccupation of many archaeologists and ethnohistorians for many years. Most of the discourse regarding Cherokee origins has centered on Cherokee migration versus in situ development. As stated in the introduction, WPA archaeologists such as Webb (1938) and Lewis and Kneberg (1946, 1958) were strong proponents of the population replacement model for the explanation of Cherokee origins. The Cherokee were argued to have displaced the earlier Dallas groups (who were argued to be antecedents of the historic Creeks). The Mouse Creek culture was seen as an entirely different ethnic group (the Yuchi).

The idea of population replacement continues to have its supporters. Based on the occurrence and location of sixteenth- and seventeenth-century Spanish artifacts Smith (2002) suggests significant population movements during this period. He argues that following the abandonment of certain river drainages in East Tennessee and northern Georgia there appears to be an influx of new groups, which he interprets as Cherokee speaking peoples.

Questions regarding the connection of local Native American inhabitants and earlier mound construction and material culture have played an important role in the establishment of North American archaeology as a discipline. Cyrus Thomas (1894) was one the first scholars to suggest a link within this region between earlier "moundbuilders" and the Cherokee. Coe (1961) was a major proponent of the cultural continuity model for the explanation of Cherokee origins, a sentiment followed by Dickens (1979).

Following Coe's and Dickens' earlier work, other researchers have suggested some variant of cultural continuity between East Tennessee and northern Georgia Mississippian sites and Cherokee groups. For example, Schroedl (1986) contends that Cherokee development in East Tennessee was the result of the collapse of chiefly authority during the sixteenth century, which led to a less hierarchical social reorganization. One issue that seems to confound this problem is the relationship between Mouse Creek and Dallas communities during the Late Prehistoric/Protohistoric period (Schroedl 1986). Similarly, Hally (1986) points to similarities between earlier Lamar material culture, in northern Georgia, with that of the historic Cherokee. He suggests that these similarities represent a shared ancestry of the two cultures.

Although, as argued by Smith (2002), there does appear to an occupational gap during the seventeenth century in areas of northern Georgia such as the Coosa River Valley. The argument suggesting occupational gaps in Northern Georgia and in East Tennessee, led Dickens (1986) to retract some of his earlier arguments for cultural continuity. Dickens suggests that while there appears to be evidence of cultural continuity between the earlier North Carolina Qualla Phase and the Cherokee Phase, this does not appear to be the case in East Tennessee and North Georgia. Dickens argues that western North Carolina groups' cultural adaptive strategies and

habitat allowed them to withstand the decimating effects of the Spanish entradas where their more specialized, aggregated neighbors to the east and south could not. Dickens (1986:81) states "The Cherokee later spread into the large river valleys of southeast Tennessee, northwest Georgia...where they merged with the remnants of the large, specialized chiefdoms that formerly had dominated those areas."

Likewise, Rodning (2002) envisions a scenario for Cherokee origins not unlike the scenarios postulated by Knight (1994) for the Creek and Galloway (1995, 2002) for the Chickasaw in which social reorganization and population movement led to an amalgamation of formerly distinct ethnic or cultural groups. Similar to Dickens (1986), Rodning seems to favor a combination of both models in which cultural continuity may apply, but not necessarily a continuity that was purely unbroken and perhaps involved the coalescence of formerly distinct groups. His arguments are particularly intriguing in relation to this study since "the coalescence of native communities in southern Appalachia during these years was guided in some ways by the long-term histories of power within Mississippian chiefdoms" (Rodning 2002:157). While Rodning was specifically referring to western North Carolina groups, the same argument could apply to regions of East Tennessee and North Georgia. The biological distance analysis among late Mississippian groups in the portion of southern Appalachia lends insight into how exactly these" long-term histories of power" or at the very least interactions were constructed at the time of European contact.

Summary and Discussion

As with research on the Mississippian Period in general, the social and political integration between and within the northern Georgia and eastern Tennessee study area typically is discussed within the framework of the idealized chiefdom model. Specially, within the study region and time period, scenarios for political integration sometimes are framed in terms of a paramount chiefdom, based on sixteenth-century ethnohistoric descriptions of Coosa. This characterization of the region is hotly debated.

The debate centers on two separate issues: whether the reconstruction for the De Soto entrada is correct, and whether the descriptions by the Spanish are wholly accurate. The reconstruction of De Soto's route is a difficult task, contingent on the distance measure used in the reconstructions. Also important is whether Spanish artifacts entered the archaeological record at their place of introduction, or if these artifacts were traded like many long distance prestige artifacts.

Even if the presence of Spanish artifacts indicates that "De Soto slept here," does their presence also necessarily mean that the entrada's characterization of Native American political integration was entirely accurate? Blitz and Lorenz (2006:97) describe a paramount chiefdom as "not a unified political organization with a territory as were simple and complex chiefdoms; it was an interaction sphere of powerful and weak chiefdoms engaged in temporary alliance, exchange, and warfare interactions." Is such an alliance necessarily a "chiefdom" as classically defined? Furthermore, what is the archaeological evidence for this alliance and at what level were these groups socially integrated?

There is good evidence for long distance interactions between northern Georgia and southeast Tennessee (at least in the Chickamauga Basin) during the Hiwassee Island and Wilbanks Phase as demonstrated by the blend of material culture at northern Georgia sites such as Bell Field and the aforementioned changes in the Hixon site mortuary program, corresponding with the rise of Etowah. Whether these data should be construed as political integration, and by extension a formal centralized authority, or a simple alliance between autonomous groups, or, alternatively as elites from East Tennessee mimicking elites to the south, warrants further consideration.

In regards to a sixteenth-century alliance in the study region, the archaeological evidence is less clear. The distribution of Citico gorgets suggests that these sites were part of a long distance exchange network. Nonetheless, this exchange network extended beyond the reconstructed Coosa paramountcy. Whether or not Muller's (1997) analysis supports Tennessee as the center of origin for these gorgets, the data clearly do not support the area surrounding the proposed Coosa paramount center (Little Egypt). Other types of material culture that may suggest a regional alliance are ambiguous at best.

On a more theoretical line, such focus on the construction of chiefdoms within the region can be a detriment in understanding other ways in which these groups may or may not have been socially integrated and the ways in which these interactions may have shaped differences or similarities in the construction of cultural identities. It should be noted that distinct differences in material culture such as those discussed above do not necessarily denote distinct cultural identities and little social integration. Nor does shared material culture necessarily signal collective identity. Multiple lines of evidence must be used to develop a deeper understanding of

how social identities are constructed and maintained. These other lines of evidence can include mortuary analysis (discussed in the following chapter) and biological affinities (the main purpose of this study).

The importance of understanding the processes of these interactions extends far beyond the Coosa debate. Decreased evidence for sociopolitical complexity during the Mouse Creek Phase and during later occupied Dallas Phase sites and the cessation of moundbuilding during the Mouse Creek and Barnett Phases suggest that populations within the study region were already in a state of reorganization just before and at the time of Spanish arrival to the interior Southeast. These processes may have led to the development of historic tribes within the area. It is my contention that understanding how these groups interacted during this time can lead to significant insights into the process of social change and the development of historic tribes in the Southern Appalachian region.

Chapter III: Individual Site Descriptions and Mortuary Data

The archaeological sites that are the source of data for this study were excavated by different investigators over many decades and under differing circumstances. The site descriptions and excavation histories presented here provide context for the biological distance data and also highlight broad similarities and differences in the mortuary programs. The latter discussion focuses on body deposition, burial location (domestic versus public architecture), and the types and quantities of funerary objects. All of these variables have been demonstrated to relate to social organization, the construction of cultural identity and ethnicity, gender distinctions, and ideology (e.g., Arnold and Wicker 2001; Beck 1995; Binford 1971; Brown 1981; Carr 1995; Peebles and Kus 1977; Goldstein 1976; Rodning 2001; Saxe 1970, 1971; Sullivan 2001). Equitable discussion of the mortuary program for each site unfortunately is impossible given differences in the excavation strategies and record keeping.

Site Descriptions

Fains Island (40JE1)

Fains Island is located on the French Broad River in Jefferson County, Tennessee. The island was inundated the Douglas Reservoir, created by the construction of the Tennessee Valley Authority's (TVA) Douglas Dam. Although reports indicate there were several known archaeological sites in the reservoir area, only two sites, Fains Island and Zimmerman's Island (40JE2) were excavated under the auspices of the Works Progress Administration (WPA) before dam construction. The excavation at Fains Island, under the direction of T.M.N. Lewis and C.C. Wilder, began in 1934 (Lewis and Wilder 1934). The archaeological emphasis was on the

mound burial sample. Excavators investigated the mound itself, the periphery of the mound, which consisted of redeposited mound sediments, and four test-trenches in the village (Figure 3-1). Excavation of the mound uncovered several large posts that indicate a ceremonial structure, with the dimensions of 35 feet by 35 feet, associated with each overlying mound level (Figure 3-2). According to Lewis and Wilder (1935), the first structure was built on the original ground surface. There were two subsequent building phases of this structure and five overlaying floors. Approximately five feet separated the first floor from the fifth and final floor.

Fains Island's mortuary pattern stands out for a number of reasons. The excavation uncovered 300 burial features. Of these features, 293 burials were associated with the mound, making Fains the largest mound-based burial sample of all Dallas sites. The majority of the burials were located underneath the five floors of the structure successively rebuilt on the mound summit. Deposition of almost all the burials is partially or fully flexed. Two burials are described as "seated." The deposition of the majority of burials was as primary interments, usually consisting of plain pits although a few were log lined.

The confinement of most of the burials to a single, successively built structure is strikingly different from most Dallas sites (Harle 2003). Another notable pattern at Fains is that unlike other Dallas Phase sites such as Toqua and the Dallas site, males and females are almost equally represented in the mound. Of those burials located within the mound, the adult sex distribution is higher for females: 75 males and 84 females. Furthermore, male and female age distributions of mound interments at Fains parallel expectations for a normal paleodemographic

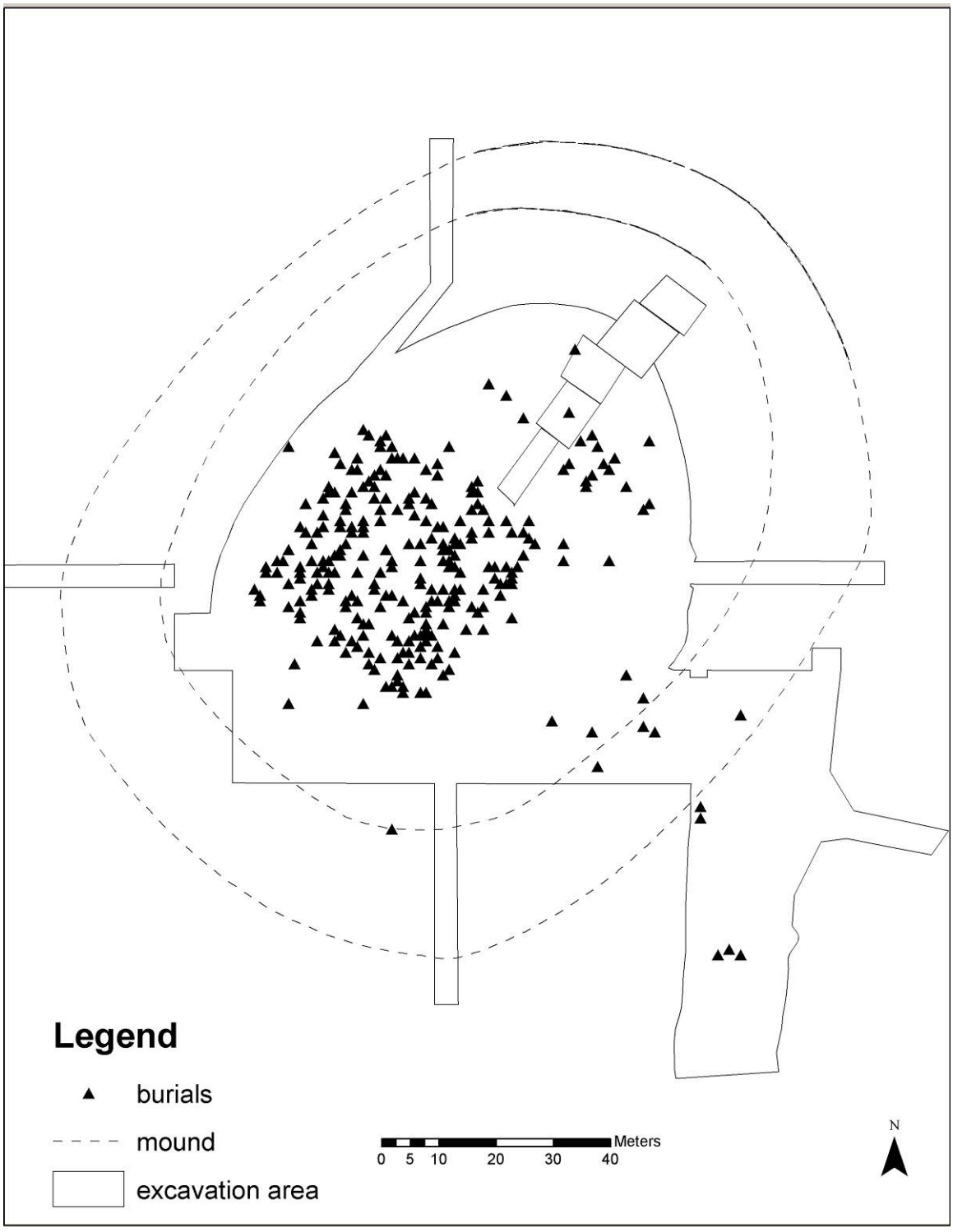


Figure 3-1: Planview of the Fains Island Site

Figure 3-2: Photograph depicting the structure associated with the Fains Island Mound
(Photograph on file at the Frank H. McClung Museum, University of Tennessee, Knoxville)

survivorship curve (i.e., a higher rate of young females at childbearing age and older females) (Harle 2003).

The distribution of certain mortuary items at Fains exhibits some of the same age and sex-based distributions described by Hatch (1974) in his study of multiple Dallas Phase sites. Males are most commonly associated with implements involving tool kits. Massive amounts of shell beads are also associated with many of the interments. Shell ornaments (e.g., beads, hair or ear pins, pendants, and gorgets) tend to crosscut age and sex categories (31 percent of subadult, 20 percent of female, and 27 percent of male burials contain shell ornaments). Shell gorgets and masks are almost exclusively associated with subadults with the exception of one male. Males, especially younger males, are more likely to have funerary objects. The majority of female (70 percent) interments contain no funerary objects.

An examination of the human skeletons found no discernible differences in nonspecific stress indicators (e.g., porotic hypostosis, enamel hypoplasia, periostitis) between individuals based on rank or gender that would be suggestive of preferential treatment or provisioning (Harle 2003). Trauma also occurs in low levels. Two individuals (one male and one female) have small, healed depression fractures on the frontal (Figure 3-3).

Ledford Island (40BY13)

The Ledford Island site was excavated before the construction of the Chickamauga Dam in conjunction with more extensive archaeological investigations in the Chickamauga Basin under the auspices of the WPA/TVA. Ledford Island is situated along the Hiwassee River in

Figure 3-3: Burial 29 at the Fains Island Site exhibiting a healed blunt force trauma (BFT) on the left parietal.

Bradley County about twelve miles from its confluence with the Tennessee River. The site is located on the southeastern portion of the island on a slightly elevated knoll (Lewis et al., 1995). The Ledford Island site is one of the four Mouse Creek sites excavated during the WPA excavations in the Chickamauga Basin. Of these sites, the occupation of Ledford Island appears to be the most substantial (Sullivan 1986).

Excavations uncovered a palisaded village with a large central plaza and a public building located on the plaza's north side (Figure 3-4). This village layout is indicative of Mouse Creek Phase sites. Although mound building appears to have ceased by the time the town was occupied, the town plan is similar to Dallas Phase sites which include a central plaza and with associated primary (winter) dwellings and secondary (summer) structures.

Excavations identified 468 burial features. The majority of these burials was located near or within the structures. Sullivan (1986) identified a clear (most likely based on kinship) burial pattern associated with these structures. Sixteen structures surround the plaza. There are segregated areas consisting of paired summer/winter structures and a household cemetery containing graves of older children and adults. Infants and subadults are exclusively interred within the winter houses (Sullivan 1986). The only difference from the mortuary patterning of Dallas sites is that the ceremonial structure is not associated with a mound.

Only the grave of one infant was associated with the large ceremonial structure. A spatially segregated cemetery on the northeastern edge of the plaza contained 86 individuals (Figure 3-5). Sixty percent (20) of the sexable individuals are adult males. This cemetery contained very few subadults (10) and adult females (9). These individuals also have the highest

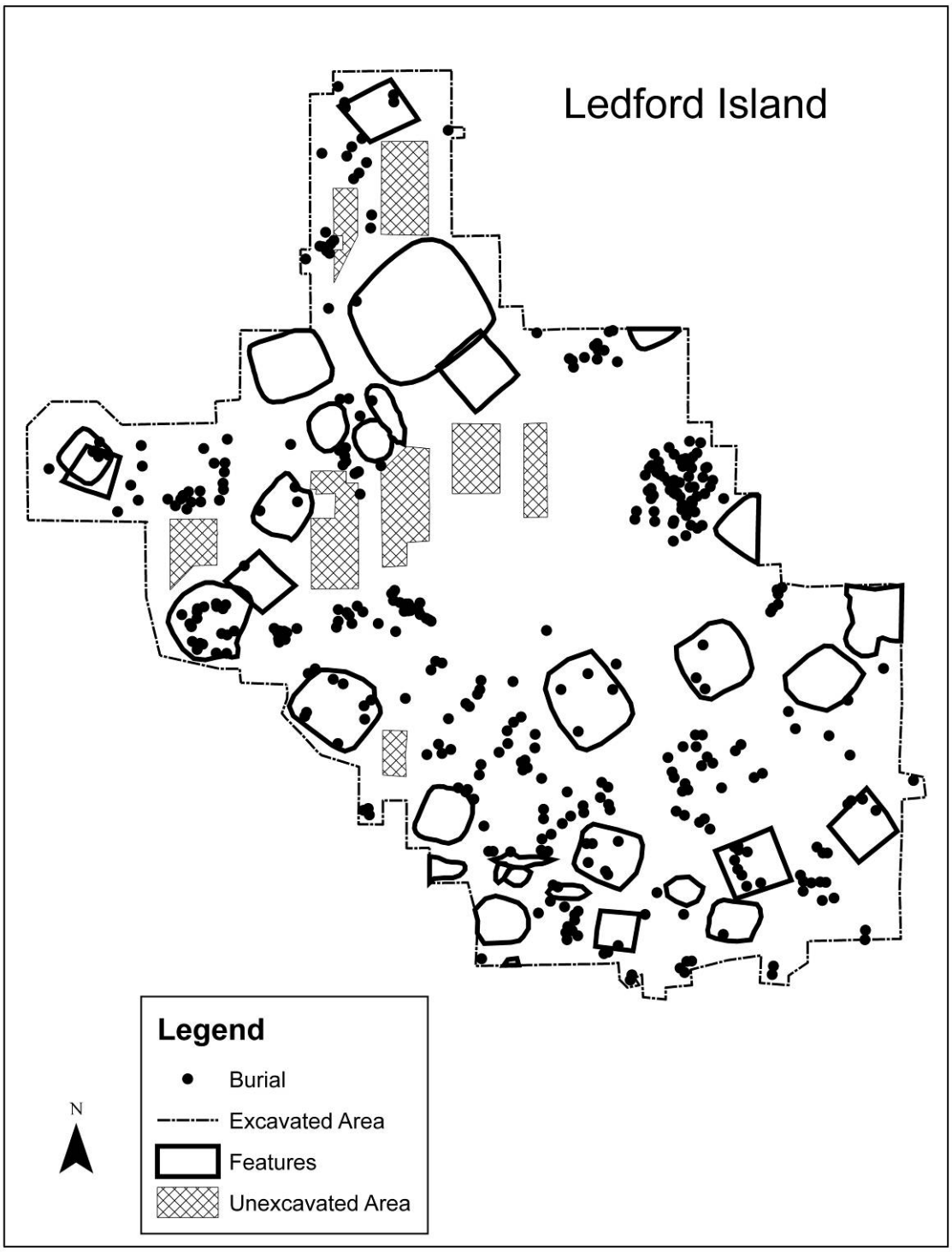


Figure 3-4: Planview for the Ledford Island Site.

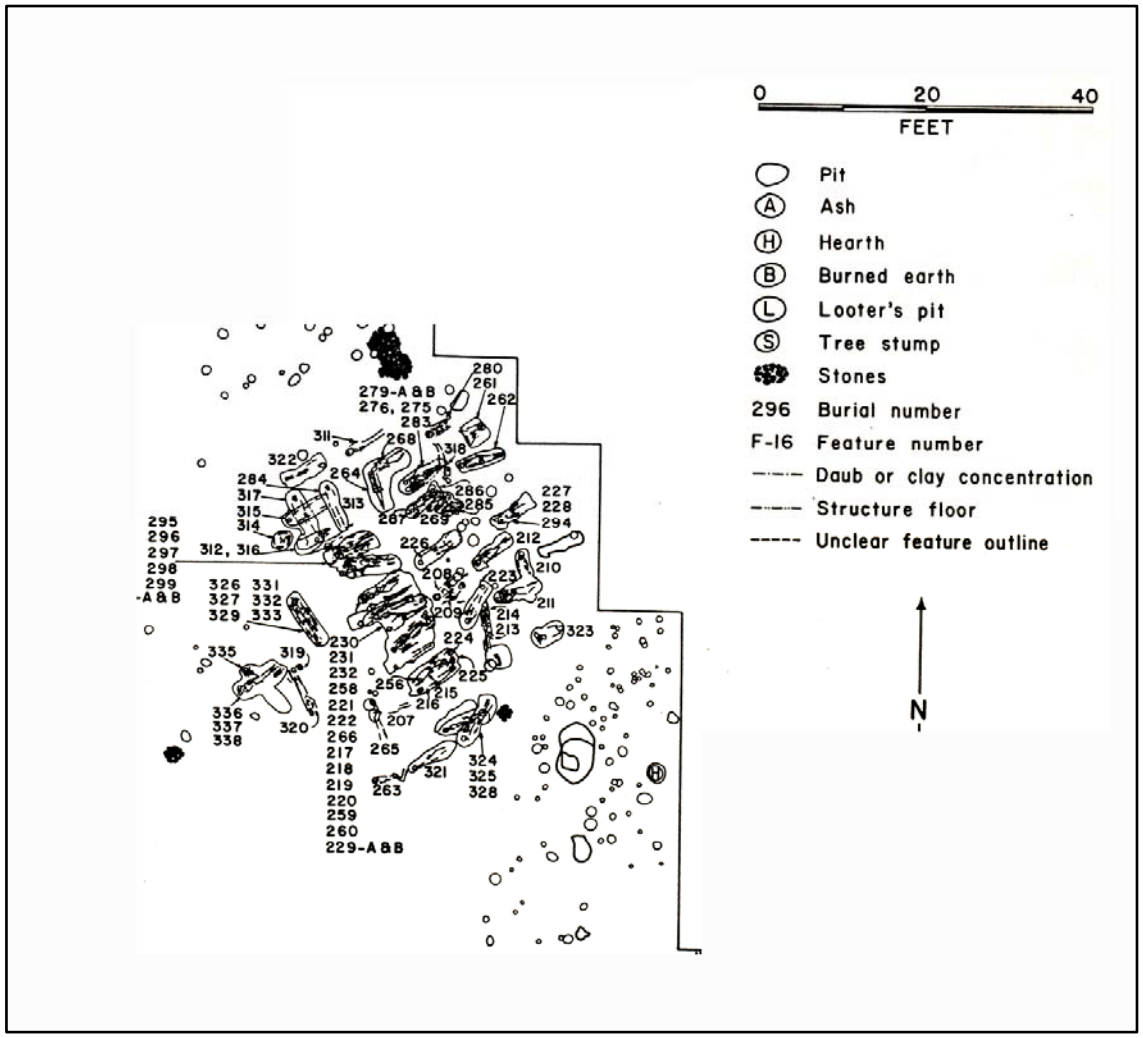


Figure 3-5: Close up of the plaza cemetery burial population at Ledford Island (after Sullivan 1986)

occurrence of funerary objects (Sullivan 1986). These funerary objects mostly are associated with males (40 percent) compared to only one of the nine females. None of the subadult graves in this location contained funerary associations. Across the plaza from the northeastern cemetery was another group of 25 individuals and one dog burial.

This pattern of unequal distribution of funerary objects by sex in the public area is contrasted by village interments where the distribution of funerary objects by sex is almost equal. Sullivan (1986) notes a significant pattern between the distributions of funerary objects by age, with an increase of inclusion of funerary objects directly proportional with advancing age for all Mouse Creek sites. This pattern is especially visible at Ledford Island site (Sullivan 1986). Within village interments, inclusion of funerary objects by sex was nearly equal: 31 percent for males and 29 percent for females. Funerary objects appear to have the same age and sex distribution of many Dallas sites as outlined by Hatch (1974). Females are more likely to be associated with pottery and shell implements and males with artifacts related to male-oriented activities (e.g., projectile points, celts, blades, and pipes) (Sullivan 1986). Shell ornaments crosscut age and sex, but the frequency of occurrence is slightly higher in female and subadult interments. Of interest is a lower frequency of shell ornamentation at Mouse Creek sites including Ledford Island when compared to the Fains Island site (Sullivan and Harle 2010).

One major distinguishing characteristic of Lewis and Kneberg's (1946; Lewis et al., 1995) classification of Mouse Creek and Dallas Phases is differences in mortuary patterning. The majority of interments at Ledford Island are placed in an extended position (58 percent), as opposed to the majority of flexed interments at Dallas Phase sites. This marks the most distinct difference between Mouse Creek and Dallas Phase burial patterning and is discussed in more

detail later in this chapter. The majority of burial pits are plain (93 percent), but one percent (N=4) of the burials are associated with stone box graves.

Boyd's (1984) skeletal analysis of Ledford Island and other Mouse Creek sites found low levels of nonspecific stress indicators. These indicators occur in significantly lower levels when compared to Dallas and Middle Cumberland sites. While trauma rates are generally low, Ledford Island contains the highest rates of trauma when compared to other sites in the Chickamauga Basin (Smith 2002). Of the ten cases of individuals with trauma indicators, seven have small, round and healed blunt forced trauma on the frontal bone; two are cases of inflicted points and one individual shows evidence of a survived scalping (Smith 2002).

Cox (40AN19)

The Cox site is located in Anderson County, Tennessee, along the east bank of the Clinch River. The site was originally excavated under the direction of William S. Webb by the Civil Works Administration (CWA)/TVA before construction of Norris Dam in 1934 (Webb 1938). Similar to Fains Island, the excavation focused solely on the approximately eight-foot-high mound. Also similar to the Fains Island site, the mound is associated with a single ceremonial structure measuring approximately 37.5 feet by 36.5 feet. This structure was first built on the original ground surface and was rebuilt twice. Most of the mound interments (39) are confined to these ceremonial structures associated with the mound (Figure 3-6). An additional ten individuals were buried along the periphery of the mound (Webb 1938).

In the 1960s, Charles McNutt conducted the second excavation of the Cox site, before its

Figure 3-6: WPA excavation of the Cox Site showing the ceremonial structure associated with the mound (Photograph on file at the Frank H. McClung Museum, University of Tennessee, Knoxville).

inundation by construction of the Melton Hill Dam. Excavation crews were provided by the University of Tennessee's Department of Anthropology during the 1960 field season, and by the Tennessee Archaeological Society's (TAS) of Knoxville Chapter, during the 1961 field season. The latter crew consisted of amateur archaeologists (McNutt and Fischer 1960). The 1960s excavations focused exclusively on the residential area of the site (Figure 3-7). This village is associated with both a Woodland Period and a Dallas Phase component. Forty-three burials were uncovered during the 1960 field season, the majority of which (25) are assigned to an Early Woodland occupation. Temporal determination is based on the depth of the burial, the associated funerary artifacts, and the uniformity of poor skeletal preservation (McNutt and Fischer 1960). These Woodland burials are not considered in this study.

The 1961 field season uncovered an additional 200 burials. Difficulties with the record keeping during these excavations, which are described in fuller detail below, makes it impossible to determine if any of these 200 burials were associated with the Woodland component at the site. Because of these difficulties, it must be noted that the Cox sample might contain some earlier Woodland burials.

The nature of the excavations at the Cox site also complicates interpretations of the mortuary program. Records and funerary artifacts from the WPA excavations and the 1960 field season are on file at the Frank H. McClung Museum in Knoxville. The records from the 1961 excavations, which were carried out by the amateurs, are incomplete. For the few burial forms retained from the 1961 field season, the descriptions do not match the current skeletal inventory

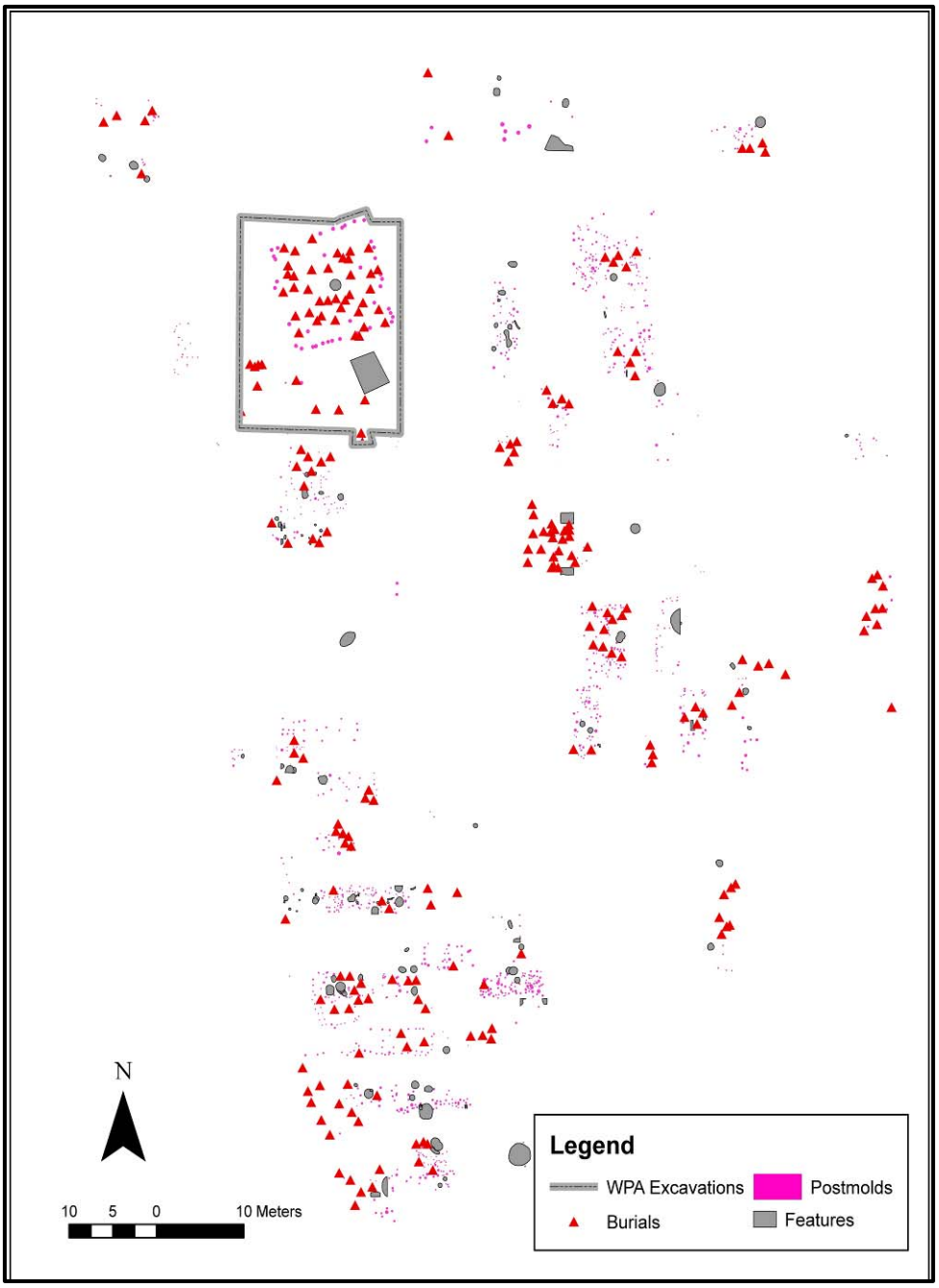


Figure 3-7: Planview of the Cox Site excavations

numbers. Another problem is that the funerary objects were not curated making it difficult to assess the reliability of the amateurs' funerary artifact descriptions.

Because mound and village skeletal materials were labeled separately, a comparison of the demographic structure of the mound and village interments is possible. A majority of mound interments were male (54 percent, N=21) as compared to females (26 percent, N=10) (Vogel 2007). This pattern is similar to other Dallas Phase sites such as the Toqua and the Dallas sites (Sullivan 2006). What differs from Sullivan's (2006) findings for Toqua and Dallas is that at Cox, the majority of females interred in the mound (50 percent) were older adults (50+). This pattern is contrasted with the male mound interments that are predominantly younger adults (20-35 years) (Vogel 2007). The pattern of age distribution is reversed with village interments where females tend to be represented by younger individuals. Very few subadults are mound interments (20 percent), but subadults dominate the village sample (37.7 percent) (Vogel 2007). For mound interments, the majority are flexed burials, although there are three "seated" burials. The records that exist for the village interments indicate a similar flexed pattern. One mound burial is described as lying extended on the stomach.

Due to the limitations of the records for village interments, generalizations can only be made regarding the funerary inclusions for the mound burials. The majority of these interments had no associated funerary artifacts (66 percent). The distribution of funerary objects by individuals where sex could be determined was equitable (6 males and 6 females). For the few subadult graves within the mound, 50 percent contained funerary objects. None of the interments appears to stand out in regards to quantity and quality of artifacts. In fact, the most elaborate burials interred in the mound are subadults.

Vogel (2007) found that eight percent of individuals at Cox showed evidence of antemortem trauma. Two of these individuals have healed rib fractures. Eight individuals of both sexes (four males and four females) had small, healed BFTs on the crania. She also observed no statistically significant differences in skeletal stress indicators between the mound and village interments.

David Davis Farm Site (40HA301)

The David Davis Farm site is located on a terrace overlooking the South Chickamauga Creek, near present-day Chattanooga. While the majority of the site is interpreted to represent a Dallas Phase occupation, a small Woodland and Archaic component also are present. Alexander Archaeological Consultants (AAC) excavated the site under Tennessee state code for cemetery termination. As a result, the focus of investigations was on the recovery of all human remains from the site. Many of the nonburial features also were mapped and sampled, but there was little time for the excavation of all of the nonburial features. Alexander and Trudeau's (2007) preliminary analysis of the post mold patterning suggests a minimum number of seven Mississippian structures at the site. Excavations uncovered 104 burial features containing 162 individuals associated within and on the perimeters of the structures.

Data from the excavation is not yet published and not available from AAC. Therefore, very limited information can be discussed here regarding the mortuary patterning. The majority of individuals was placed in the flexed position with the exception of one adult and one infant burial that were extended. Fifty-six percent of graves contained funerary objects. The presence

of six Citico style gorgets suggests a late Dallas Phase occupation. In addition, six burials contained seven European metal artifacts including a possible iron sword, an iron awl, an unidentified iron piece, a possible iron knife fragment, an iron ring, and a possible silver bead interpreted as Spanish artifacts possibly associated with De Soto's entrada (Alexander and Trudeau 2007).

King Site (9FL5)

The King Site is a large village site located near present-day Rome, Georgia, along Foster Bend on the Coosa River (Hally 2008). King is the only Barnett Phase site within its immediate area. Hally suggests that the King site was only occupied for a short period. Excavations of the site were conducted under Patrick Garrow and David Hally intermittently from 1971 to 1976 and 1992 to 1993 (Hally 2008).

The King site covers 2.3 hectares and is bounded by a palisade and defensive ditch on three sides and the Coosa River to the north. Twenty-five square structures are identified as residences (Figure 3-8). Many of the residences show signs of rebuilding either in the same place or slightly offset. Similar to Ledford Island, no evidence exists for mound building activities at the site. Two larger, possibly ceremonial, structures are located near the middle of the town beside the plaza. The larger of the two is similar to the large ceremonial structure at Ledford Island and the second Hally (2008) interprets as a possible residence or ceremonial townhouse.

The excavation recorded 249 "confirmed" burials interred within the plaza, ceremonial structure, and residential areas. Graves are located within paired residential structures, a plaza

cemetery, and the large ceremonial structure (Structure 17). The village interments represent individuals of all ages and both sexes. Ten burials are located within Structure 17. All of the individuals in this structure most likely were adults, but only three could be osteologically sexed; they are males. Two individuals contain typical "male-oriented" funerary objects that may suggest that they are also males such as those discussed below. The remaining burials (50 percent) contained no funerary objects and could not be sexed. Hally (2008) notes that while no single artifact class is exclusively represented in Structure 17 interments, projectile points occur in greater frequency and in greater individual quantities when compared to the rest of the village.

Eleven burials were associated with the plaza cemetery north of Structure 17. These burials contain both adults and subadults. Because of poor preservation, only one adult could be biologically sexed. Graves within the plaza cemetery were more likely to contain funerary artifacts (82 percent) than those within the village (43 percent) (Hally 2008).

Males are much more likely to have associated funerary objects and have greater quantities of artifacts. Males also are more likely to have more artifact classes represented in their funerary associations. Projectile points, bifacial blades, hematite, spatualte celts, gravy boat bowls, *Busycon* cups, flintknapper kits, and copper occur almost exclusively with males. Eight burials are associated with iron historic artifacts (Hally 2008) that Smith (1987) dates to the mid-sixteenth century.

The burial patterning for females contrasts sharply with that of the male interments. The majority of females (80 percent) do not contain nonperishable funerary objects. Those few

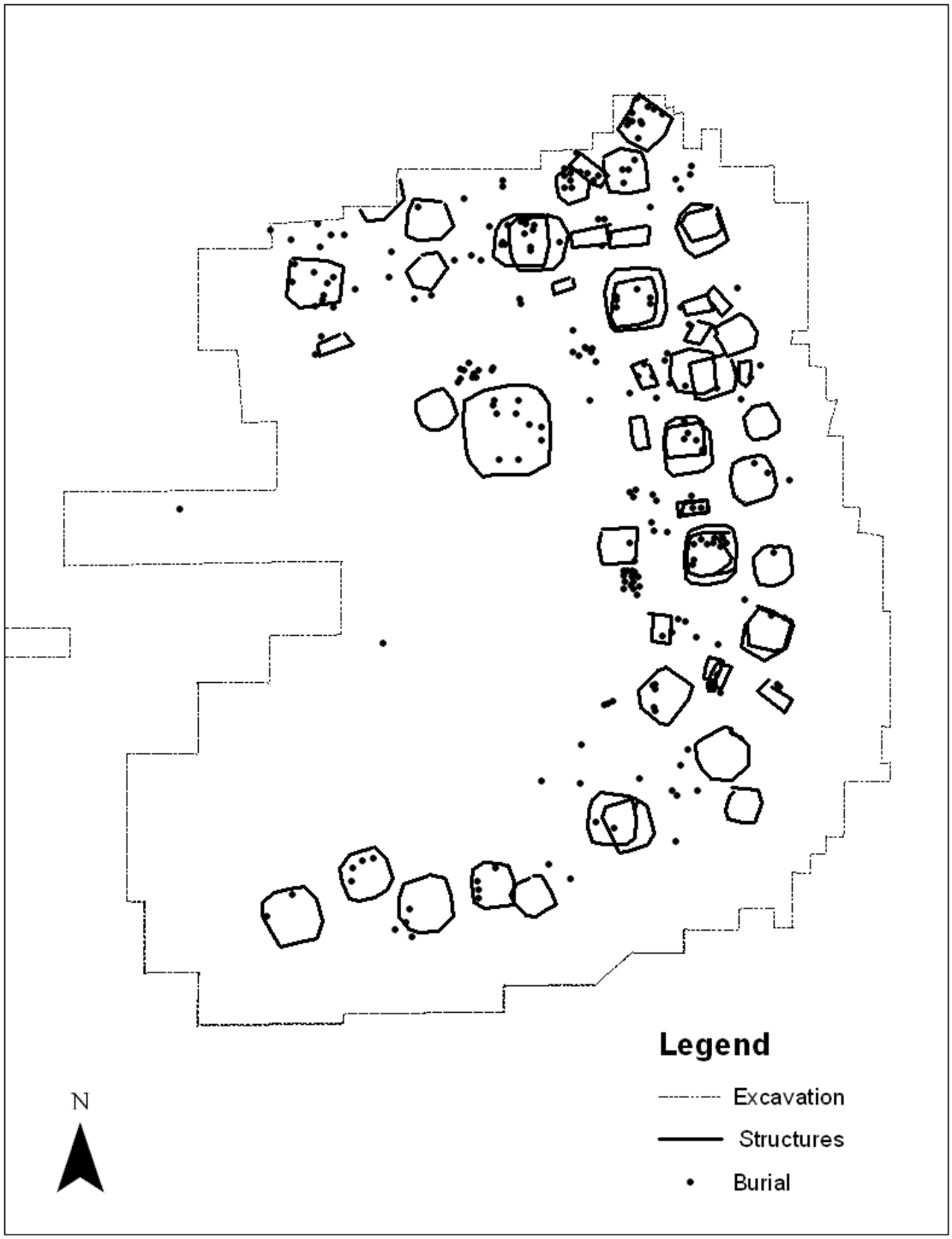


Figure 3-8: Planview of the King Site.

females interred with funerary objects have only one or two artifact classes. Female interments are almost exclusively associated with shell ornaments and pottery (Hally 2008). Hally (2008) does note that two interments that are osteologically sexed as female contained a number of artifacts that are commonly associated with male burials at the King site (e.g., bifacial blade, flintknapper kits, pipes). DNA testing confirmed that one of these females as a biological female (Hally 2008:339). While any number of explanations could be posed for these two female burials, Hally suggests these females may have gained their status as female warriors or "War Women" as they are called in ethnohistoric accounts of the Cherokee (Perdue 1998). Funerary objects occurred with 42 percent of subadult interments. Similar to the females, subadults are generally interred with only one or two artifact classes and these objects tend to be shell ornaments and pottery.

The majority of burials at King are placed in a flexed position, although a few (15) are placed in an extended position. Of the extended individuals that could be sexed, all of them are male. The majority of burial pits are plain. No stone box graves were found at the site (Hally 2008).

Several studies have been made of the King site skeletal sample. Blakely and Matthews (1990) originally reported several cases of wounds that they suggest were produced by sharp-edge metal weapons. They attribute this trauma to conflict between the King inhabitants and De Soto's men. Subsequent testing failed to confirm these findings (Milner et al. 2000). Milner and coworkers (2000) did report one case of perimortem blunt force trauma on the crania, but they suggest that the more likely source of this trauma was from a Native American celt, not a Spanish metal weapon. During the data collecting process for this study, the author examined

the King site crania for the distinctive, small healed blunt force traumas that are present on several crania from Dallas and Mouse Creek sites. No such evidence exits in the King site sample. In regards to nonspecific stress indicators in the King site sample, Humpf (1995) found no statistically significant differences between the sexes.

Little Egypt (9MU102)

The Little Egypt site is located in northern Georgia near Carters Dam on the south side of the Coosawattee River at the mouth of Talking Rock Creek. In addition to an earlier Woodland occupation, both the Little Egypt and Barnett Phases are represented at the site. The Little Egypt site contains two mounds. Mound A, the largest, measures approximately nine feet high; Mound B is approximately six feet high. Both mounds were subject to years of cultivation and flood erosion. Similarly, portions of the occupational areas have been destroyed by the same cultivation and flood processes (Hally 1978).

Two formal excavations were conducted at the Little Egypt site. The first excavation occurred in 1925 under the direction of Warren K. Moorehead (Moorehead 1932). It is difficult to reconstruct where Moorehead excavated, but there is evidence of possible large excavation pits on both mounds, suggesting that both mounds may be likely subjects of Moorehead's investigations (Hally 1978). The second excavation was conducted from 1969-1972 under David Hally at the University of Georgia in Athens (Hally 1978, 1980). The skeletal samples examined for this study are the ones excavated under the direction of Hally.

Boundaries of the Little Egypt are delineated at approximately 600 feet wide and 500 feet long. Stratigraphic and artifactual evidence suggest that early construction of Mound A occurred during the Little Egypt Phase (A.D.1400-1500). This mound construction appears connected to a

habitation zone, although the excavators could not directly associate any structures with the Little Egypt Phase. The distribution of artifacts suggests that the occupation at the site was much denser during the Barnett Phase and stratigraphic evidence suggests that the later construction of Mound A occurred during the Barnett Phase. Mound B cannot be directly associated with the Barnett or the Little Egypt Phases. Fifty-nine burial features were examined in the test trenches and units placed within the village area (Figure 3-9). Of the adult individuals that could be sexed, there are nine females and eight males, representing all age categories, and 16 subadults.

The excavation encountered three structures. One structure (Structure 1) shows evidence of burning. Hally (1980) states that historic metal artifacts were associated with this structure (one iron ax blade, two pieces of lead shot, an iron ax socket, and a glass bead). Structures 2 and 3 have multiple rebuilding Phases. Structure 2 has seven burials interred within its interior. The majority of these individuals (5) were subadults/adolescents. Only one of the two adult individuals could be osteologically sexed (an older male). Hally (1980) notes that two areas (XU2 and XU3) are stratigraphically complex and contain evidence of burning in some areas and a smattering of post molds, but no discernible structures. Hally states that stratigraphy suggests large, multi-stage hearths and prepared floors that may represent domestic courtyards similar to the ones at the King and Ledford Island sites. One individual (a female) was recovered from XU2. Of the individuals that could be aged and sexed from Unit XU3, there were three adult males, five adult females, and eight subadults.

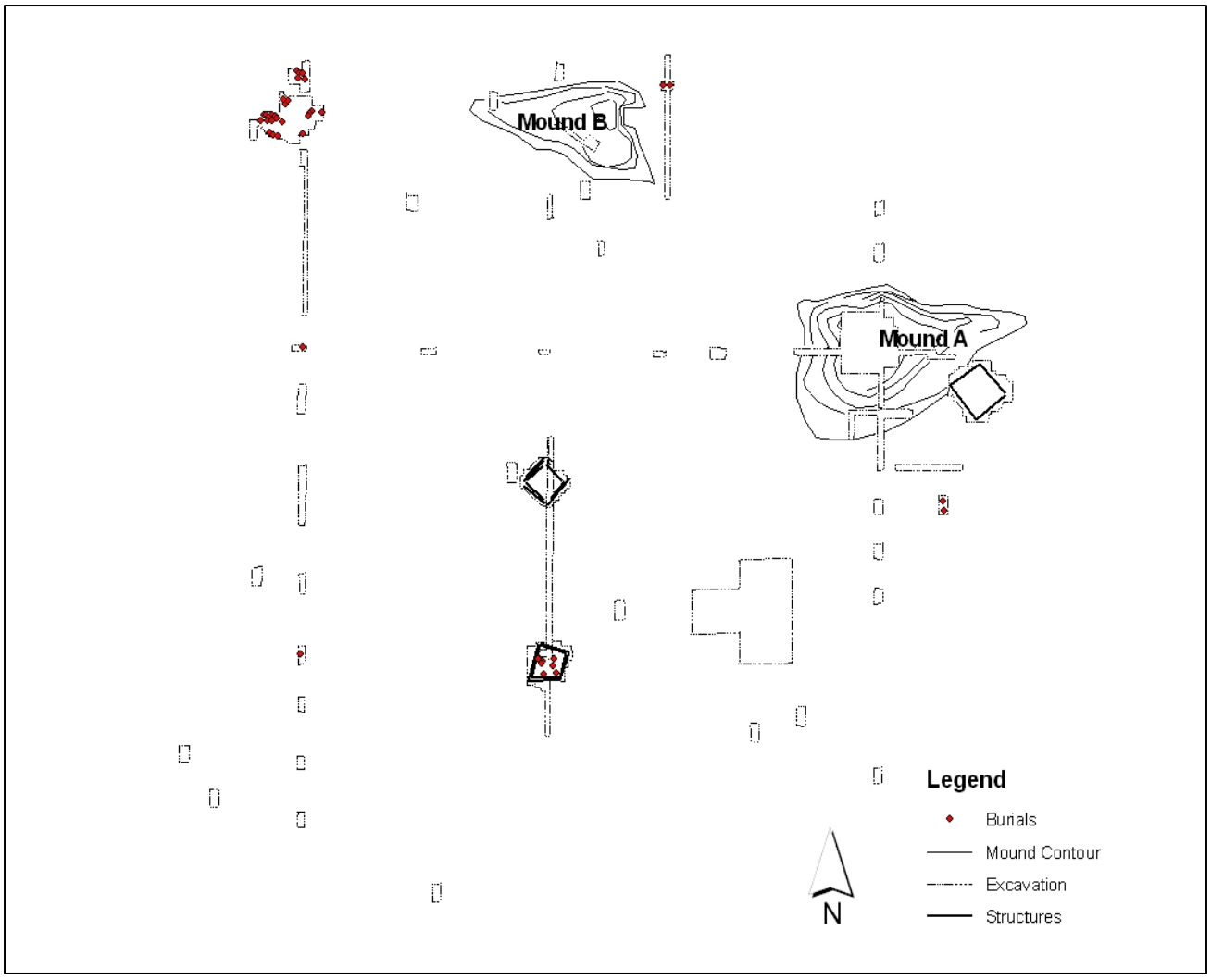


Figure 3-9: Planview for the Little Egypt site

Because the coverage of the site was limited, very little can be said about the mortuary patterning. Of the 31 individuals for whom burial position could be ascertained, all were in the flexed position. The majority of individuals interred with funerary objects that could be osteologically sexed and aged were adult females (56 percent, N=6). Three females have what Hally (1980) identifies as "worked pebbles" as funerary associations and two were associated with Dallas pottery (one of these is a double interment with an infant). Two adult males (33 percent) and four subadults (25 percent) also have associated funerary objects. The majority of these graves also contained pottery (both Lamar and Dallas).

Summary and Discussion of Mortuary Site Patterning

Theoretical Underpinnings for Mortuary Analysis

Much of the focus of Mississippian mortuary analysis has been establishing archaeological correlates of rank within funerary contexts as a means to identify levels of sociopolitical complexity (e.g., Brown 1981; Hatch 1974; Larson 1971; Peebles 1971; Peebles and Kus 1977). Rank is only one component of an individual's identity possibly represented in mortuary ritual (Binford 1971). Many recent post-processual critiques argue that burial rites do not simply reflect a static representation of an individual's social role in life. Mortuary rituals pertain to relationships among and between the deceased and social agents or actors who can transform the dead into powerful social memories that can be evoked for political, economic, or ideological purposes (e.g., Cannon 1989; Charles and Buikstra 2002; Hodder 1982; Parker

Pearson 1982; Shanks and Tilley 1982). The debate regarding mortuary analysis over the last few decades and the issues raised by both processual and post-processual archaeologists "has driven home the point that burials and associated mortuary practices embody a variety of coded messages left by the living regarding the deceased and their society and culture and that interrelationship between the living and the dead in specific historical and social contexts are largely responsible for the observed variation in mortuary practices" (Schimada et al. 2004).

Similarly, some have critiqued earlier mortuary analyses for being too influenced by the Western concept of the individual (Gillespie 2001). In many cases, research focuses only on the most dominate individuals or groups. Within Mississippian research, this focus has been on the "chiefly elites". Only recently have researchers examined mortuary ritual as a means of inferring the presence of social networks based in some part on real or fictive kinship or more broadly writ cultural identity.

While mortuary ritual can be encoded with multiple meanings, the focus of the discussion here is on the construction of cultural identity. Beck (1995) notes that it is through this lens of cultural identity that other forms of individual identity (e.g., gender, age, rank) are constructed (McHugh 1999; Scott 1999; Gibbs 1987). This perspective does not imply that the construction of identity is passive, but rather "identities are constructed through interaction between people and the process by which we acquire and maintain our identities requires choice and agency" (Diaz-Andreau and Lucy 2005:2). Mortuary ritual becomes an opportunity for the living to maintain or solidify social structures (Shimada et al. 2004). Furthermore, mortuary ritual is ideal for examining the construction of cultural identity since it marks the interaction of social

organization, economy, material cultural, and ideology that are shaped and constrained by group membership (Beck 1995; Bloch 1987; Metcalf 1982; Sullivan and Harle 2010).

The observed variation in mortuary practices within the proposed Coosa Chiefdom can be viewed in the light of this discussion., The placement of the dead, the material culture interred with the inhumations, as well as the bodies themselves are important variables for considering similarities and differences in aspects of the construction of identities. As stated previously, this discussion marks an extension of Sullivan and Harle's (2010) research on the construction of cultural identity represented by the mortuary practices at the Ledford Island and Fains Island sites. Limitations for such interpretations include the fact that archaeologists can only observe the end result of the entire mortuary ritual, which may have included music, attendees, and feasting. Another limitation, for this particular study is the fact that differences in excavation strategies, record keeping, and available information preclude a full discussion of the similarities and differences of burials both within and between these sites.

Mortuary Spatial Arrangement and Funerary Artifact Distribution

The burial spatial arrangements at most of the analyzed sites follow a general plan of mortuary program at most Late Mississippian and Protohistoric sites in southern Appalachia. Burials were placed both in the domestic sphere within and around paired residential complexes and within the public contexts, either in mounds or townhouses (Dickens 1979; Hally 2008; Sullivan 1986; Rodning 2004; Polhemus 1987). Though we can only speculate about sites without full excavation coverage of the entire villages, it is plausible that these sites also followed a similar mortuary arrangement.

One exception may be the Fains Island site. The spatial arrangement of mound interments beneath the floors of the single centralized structure as well as the demographic makeup of the mound interments is strikingly similar between Fains Island and Cox. Distinct pottery motifs found within the Fains Island assemblage (Howell 2005) that may also be present at the Cox site (Bobby Braly personal communication, 2009) also suggest similarities between the two regions. Yet the large number of individuals interred in the Fains mound stands apart from the other mounds. Although there is an underrepresentation of subadults in the Fains Island mound, the interments by age and sex appear to fit within the expectations of a normal demographic profile. Interment in the large building on the mound does not appear to be exclusively associated with particular leaders or a particular kin group. Instead, this public facility appears to have been accessible to a large number of individuals and may have served to solidify group identity for the entire community.

While the spatial distribution of burials at many of the sites used in this study is similar, what does appear to differ between sites is the notion of who should be included in public and private spheres. At both the Cox and Fains Island sites, older female interments were located in the public sphere. This pattern differs from Sullivan's (2006) findings for more southerly Dallas and Mouse Creek groups where no older females are interred within the public sphere, but are only associated with residences. The pattern at Fains Island and Cox is also starkly contrasted by the King site plaza where none of the individuals, *who could be sexed,* were females (although it should be reiterated that 50 percent of the individuals within the plaza area could not be sexed).

The inclusion of certain suites of funerary objects at the Mouse Creek, Dallas, and Barnett Phase sites conforms to the gendered distributions originally noted by Hatch (1974).

Differences among the sites in the quantities and percentages of funerary objects based on sex are of particular interest. As discussed in the chapter two, Sullivan (2001, 2006) documents an elaboration of funerary object inclusion with increasing age of adult females at Dallas Phase sites in the Chickamauga Basin and on the Little Tennessee River. On average, older women are more likely to be interred with a greater number of funerary objects than their male counterparts. This is not the case for Fains Island; the number of funerary objects included with females decreases with age. The same is true for the Cox site mound. The interment of older females in more public contexts (platform mounds) at Fains Island and Cox perhaps suggests that there may have been less of a dichotomy between the sexes regarding pathways to power and authority than at sites where the graves of these women are less visible (in residential areas) such as at other Dallas Phase sites or at the King site. The Mouse Creek Phase Ledford Island site also appears to conform to the public versus private sphere for sex-based interments (Sullivan 2001, 2006).

Male interments at Ledford Island are more likely to include a higher quantity of funerary objects within the public sphere than males or females interred in residential areas, but males and females interred within the private, residential areas are equally as likely to contain funerary objects.

The King site also contrasts with Dallas and Mouse Creek Phase sites markedly in regards to funerary artifact distributions. Very few females (20 percent) at King are associated with any funerary objects. Sullivan (2001, 2006) suggests that rich interments of older females at some Dallas sites may reflect separate pathways for female and male authority and prestige. The only rich interments of female burials noted by Hally at the King site were two female

burials associated with "male associated" funerary objects, suggesting that at least at King, female prestige was not achieved in its own right but by pathways of male gendered prestige.

Differences between sexes within the observable mortuary patterns at these sites may represent differences in the construction of gender roles and differing social status among socially distinct groups. Gender is defined as a "social and cultural construct comprising roles given to, and the identities perceived by, men and women in a particular society" (Gibbs 1987:80). Ethnohistoric accounts also note distinct differences in gender roles regarding power and authority among the eighteenth-century Creek and Cherokee. Within Creek society, women were excluded from participating in any political office including as clan elders (Sattler 1995), which is quite different from Cherokee society in which women as well as men participated in decision-making and in council meetings (Perdue 1998). In fact, the Cherokee women's participation in leadership decisions led seventeenth century emissary to the Cherokee Henry Timberlake (quoted in Perdue 1998:55) to state "the story of the Amazons [was] not so great a fable as we imagined, many of the Indian women being as famous in war, as powerful in the council." Much greater emphasis also was placed on achieved status by age than among the Creek. Sattler (1995) suggests that these differences may have led to greater equality between the sexes in Cherokee societies.

Sullivan and Harle (2010) also note distinctions in the inclusion of objects of personal adornment between the Ledford Island and Fains Island burials that may suggest cultural identity differences. In many Mississippian mortuary analyses, the inclusion of shell ornamentation is discussed within the realm of political economy (e.g., signifiers of social stratification, evidence of a prestige good economy) (but see Thomas 1996). Very rarely are these ornaments viewed as

material symbols and signifiers of group identity. As Boyd (2002:142) discusses, ornamentation may mark the symbolic representation of particular ideas or "subjective meanings" which are 'inscribed' on the body as a means of conveying these ideas and meanings. Differences in the interment of shell adornment by sex can "yield insight into aesthetics and display, providing clues to how these realms of social life are mediated by gender" (Thomas 1996:32). It is impossible to know if shell ornaments were worn by the deceased in life. Ethnohistorical accounts document the likelihood of shell beads being commonly worn ornaments by southeastern Native Americans (Clayton et al. 1993; Swanton 1946; Williams 1930).

Thomas (1996) and Hatch (1974) both note that shell beads are not exclusively interred with any sex or age group and not necessarily with the "richest" burials among Mississippian sites in North Carolina and Tennessee. The inclusion of shell ornamentation (beads, hair or ear pins, pendants, and gorgets) may follow a generalized pattern within the South Appalachia region. Sullivan and Harle (2010) point to differences in the occurrence of personal adornment in graves at Fains Island and Ledford Island and for Mouse Creek Phase sites in general. At Fains Island, shell beads are the most common funerary artifact class. While subadults burials are the mostly likely to contain shell ornaments (31 percent), males are more likely to contain these items than females (27 percent and 20 percent, respectively). At Ledford Island, only four percent of males and one percent of females were interred with personal adornment. In fact, Fains Island adults (especially males) are more likely to have shell ornaments than all three of the extensively excavated Mouse Creek Phase sites on the lower Hiwassee River (Ledford Island, Rymer, and Mouse Creeks). The combined burial samples of these sites are over 600 individuals. As Sullivan and Harle (2010) note, regardless of whether or not these items were

worn in life, it is the tradition of interring such objects with the dead that clearly differed between Fains Island and the contemporary Mouse Creek Phase sites. Such differences may point to differences in traditional practices of aesthetics and display that possibly reflect distinctions in cultural identity. The distribution of shell ornamentation at the King site is similar to Fains Island. Shell ornamentation at King is the second most common funerary artifact class, following projectile points. As at Fains Island, at the King site shell adornment was more commonly interred with males (18 percent) than with females (10 percent).

Body Positioning

Body positioning in the grave is an important means of manipulating the body that can be used to mark social differences both among and within groups. Differences in body positioning may also represent ideological differences in views of how an individual enters the afterlife (Parker Pearson 1999:54). The majority of fully extended Mouse Creek Phase burials, as represented by the Ledford Island site, marks a stark contrast to other sites in this study and to South Appalachia burial patterns in general. For all Mouse Creek sites, 64 percent of individuals were placed in the extended position versus 11 percent of individuals in the flexed position. The collapse of a more hierarchal social system is often suggested as a reason for changes observed in Mouse Creek societies from those of earlier Dallas Phase sites (Boyd and Boyd 1991; Schroedl 1986). Such a scenario cannot account for the differences in the treatment of the body after death. Elsewhere in the region, at Dallas Phase sites such as Cox and Fains Island, flexed burial positions dominate the mortuary program. These fifteenth Dallas sites also have contemporary occupations with the Mouse Creek Phase sites. The social structure at Fains

Island and Cox also appears less hierarchical than proposed for earlier Mississippian sites (Harle 2003; Vogel 2008). While a small number of extended burials were identified at the King site, the typical burial position for Barnett Phase sites as represented by King and Little Egypt, is flexed.

If changes in social structure alone cannot account for differences in bodily treatment of the dead, what can? Was fundamental social reorganization among Mouse Creek Phase communities associated with fundamental changes in the way these groups constructed collective identity? Did Mouse Creek groups actively attempt to set themselves apart from other groups in the surrounding area? Others have argued that this shift in burial positioning and the presence at some Mouse Creek sites of stone box graves may represent an influx of Middle Cumberland groups (Lewis and Kneberg 1946). It is notable that Ledford Island is the only site in this study that contains some stone box graves, a feature common in Middle Cumberland sites. Nonetheless, other material cultural evidence does not support this argument (Kimball and Baden 1985) and previous biological distance analyses described in chapter four are conflicting (Berryman 1975; Boyd and Boyd 1991).

Bioarchaeological Data

Bioarchaeological data are also another important means of exploring the construction of rank, gender, and cultural identity within past societies. As Sofaer (2006:21) notes, "The skeleton embodies the history of social relationships and is an artifact of those relations." A similar pattern in distribution of skeletal indicators of nonspecific stress is found at the King, Cox, Fains Island and Ledford Island sites. Insomuch as differences in skeletal indicators of

nonspecific stress can inform about differences in morbidity between groups (c.f., Steckel and Rose 2002; but see Wood et al., 1992), no significant between-sex differences in the distribution of nonspecific stress indicators is observed at these sites or among the more elaborately provisioned burials. The latter suggests individuals were not being provisioned based on gender and rank, which would have significantly affected differences in morbidity.

An important difference among the study sites used in this analysis is the occurrence of trauma. Fains Island, Ledford Island, and Cox all exhibit non-lethal blunt force trauma (BFT). Smith (2001) discusses this pattern at Dallas and Mouse Creeks sites in the Chickamauga Basin and attributes these traumas to deliberate non-lethal blows indicative of codified interpersonal conflict resolution. The fact that this pattern appears at Dallas sites outside the Chickamauga Basin suggests that this phenomenon existed throughout Dallas and Mouse Creek communities and may suggest that this type of violence was encoded with specific cultural meaning. While trauma is evident at King and Little Egypt, this type of small, healed BFT was not identified. Though more skeletal samples from Barnett Phase sites need to be examined for a more definitive statement, the findings to date suggest that individuals from these communities were not part of the same system of interpersonal conflict resolution suggested by Smith for Dallas and Mouse Creek Phase communities.

Conclusion

The mortuary programs at the study sites follow a similar mortuary program of Mississippian communities in southern Appalachia, but there are distinct differences in varying degrees in burial positions, funerary artifact distributions, and gender distinctions among Mouse

Creek, Dallas, and Barnett Phase mortuary programs. As argued elsewhere (Sullivan and Harle 2010), differences in the mortuary programs of contemporary Dallas and Mouse Creek Phase communities may suggest differences in the cultural traditions of two culturally distinct groups. This observation appears true for Barnett Phase communities as well. A question is: at what scale does this level of cultural distinction lay? Were these separate ethnic groups, distinct groups that were part of a larger cultural system, or a combination of both? Furthermore, how did these cultural distinctions shape the interactions of community members? The following chapters discuss and use biological distance analysis to address these questions.

Chapter IV: Biological Distance Studies

Biological distance studies explore the "interplay between biological and cultural factors in human microevolution" (Relethford and Lees 1982:113). This chapter outlines the methodological and theoretical foundation for the use of nonmetric traits for the estimation of biological distance. Following this discussion is a review of the application of biological distance in the study of cultural or ethnic boundaries, postmarital residence patterns, and kinship analysis, especially as it applies to Mississippian culture studies.

Defining Biological Distance

Biological distance refers to the measure of relatedness or divergence of a population. Inter and intra-population polygenic or quantitative traits (i.e., traits that are subject to the simultaneous effect of multiple genes) frequencies are examined through multivariate statistical analysis. Biodistance analysis makes several *a priori* assumptions some of which were outlined by Stojanowski and Schillaci (2006) and elaborated on here:

1) Genetic drift and gene flow affect allele frequencies for populations sharing similar environments. Genetic drift is a stochastic process in which certain alleles can become fixed or lost. Thus, genetic drift leads to a decrease in genetic diversity within populations. The effect of drift is proportional to population size. Within large populations the effect of drift may be negligible as opposed to smaller populations where genetic drift can lead to fixed or the loss of alleles at a more rapid rate. Conversely, gene

flow via migration or exogamous marriage patterns leads to introduction of new alleles and therefore increases genetic diversity within populations;

2) Changes in allele frequencies result in observable changes in skeletal traits. This is true both in nometric and metric traits and will be discussed in further detail below;

3) Environmental effects on phenotypic variation within populations are minimal or randomly distributed (Cheverud 1988). Furthermore, in the case of the current study region the environment for East Tennessee and North Georgia are extremely similar and, cultural adaptations within both regions was also similar. For example, both were agriculturalists and depended heavily on a maize based diet; and

4) Isolation by geographic will increase genetic distances. As discussed in Chapter 1, using a combination of Wright's (1951) infinite island model, the unidimensional stepping-stone model (Kimura and Weiss 1964) and Harpending and Ward's (1982) migration matrix, Konigsberg (1990) demonstrated that populations that are separated by further distances will be more biologically distinct than populations at closer distances (Konigsberg 1990). Thus, it is expected that the more distance between populations the less expectation for gene flow (controlling for temporal distance). If genetic and biological distance is not positively correlated then it would suggest that perhaps other factors, such as cultural ones, are limiting gene flow between geographic proximate groups (e.g., Schillaci and Stojanowski 2005). Conversely, temporal distance (controlling for spatial distance) should be negatively correlated with biological distances (Konigsberg 1990). Although Konigsberg (1990) demonstrated this with mathematical

modeling utilizing cranial nonmetric traits from the Lower Illinois and Mississippi River Valleys, this pattern is applicable to all populations.

Furthermore, there is an expectation that traits used in biological distance analysis will be:

1) Reliably scored in that observable differences in trait frequencies between populations represents biological and not inter- or intra-observer differences;

2) Sufficient in variability and frequency to provide information on population differences and;

3) Selectively neutral (Saunders 1989)

Two classes of quantitative traits are generally used in biological distance analysis: metric and nonmetric (or discrete) traits. Metric traits are continuous variables obtained through linear analysis. The unit of analysis is cranial, dental, or postcranial metrics. The practice of artificial cranial deformation within a population and poor preservation and fragmentation of particular skeletal samples can hinder cranial metric analysis (Konigsberg, Kohn, and Cheverud 1993). Likewise, postcranial metrics are particularly sensitive to environmental factors such as nutritional stresses (Buikstra 1976).

Cranial nonmetric traits occur in the form of accessory ridges, extra-sutural bones, accessory foramina, tubercles, and differences in the location of foramina. Similarly, dental non-metric traits occur in the form of differential size and shape of cusps located on the lingual, buccal, mesial, and distal surfaces, variation among occlusal cusp and ridges; and differences in root number. Nonmetric traits operate under a continuous "liability" or risk underlying the expression of a discrete trait and referred to as a "quasicontinuous" genetic distribution

(Grüneburg 1952). Once one crosses over a certain "threshold," then the trait is expressed (Grüneburg 1952; Fraser 1976). Thus, the phenotypic expression is non-continuous and is recorded as presence or absence (Cheverud and Buikstra 1981). It should be noted however, the expression of particular traits, especially in the case of dental traits, can range from slight to pronounced. The number of recorded traits present, or "incidences," is converted into mean trait liabilities, the methodology for which will be discussed in the following chapter. Nonmetric traits are useful in fragmented skeletal series and are less affected by cranial deformation (Buikstra 1976; Konigsberg et al. 1993; Papa and Perez 2007).

Heritability of Metric and Nonmetric Traits

Polygenic traits are impacted by both genetics and environment; thus, biological distances reflect both genetic and environmental differentiation among populations. Phenotypic variation (V_P) of a quantitative trait can be view as:

$$V_P=V_G+V_E$$

where V_G and V_E represent the genetic and environmental variance (Konigsberg 2000). Within the multivariate realm the phenotypic covariance matrix is written as:

$$P=G+E$$

where G represents the genetic covariance matrix and E represents the environmental covariance matrix. Cheverud (1988) noted that phenotypic and genetic correlations are similar when employing effective population size of greater than 40 individuals. Likewise, Konigsberg and Ousley (1995), using anthropometric traits from the Boas dataset, concluded that the genetic variance/covariance matrix is proportional to the phenotypic variance/covariance matrix.

Important to this discussion is the concept of heritability. The relationship of additive genetic effects is referred to as narrow sense heritability (h^2). h^2 is the degree to which a trait is passed from parent to offspring and expressed as the ratio of total additive variance (V_A) divided by the phenotypic variance (V_p) or:

$$h^2 = V_A/V_P$$

(Falconer and MacKay 1996).

Several studies have addressed the heritability of both metric (Boas 1908; Konigsberg and Ousley 1995; Cheverud 1988; and Sparks 2001) and nonmetric traits (Cheverud and Buikstra 1981a, 1981b, 1982; Sjovold 1984; Konigsberg and Ousley 1995; Leamy 1974; Self and Leamy 1978). Within these studies, heritability can range from h^2=.000 (or no genetic heritability) to h^2=1.000 (complete genetic control of a trait). Because heritability studies require some form of pedigree data, many skeletal trait heritability studies are based on non-human samples, the most utilized being an extensive macaque skeletal collection from Cayo Santiago (Cheverud 1988; Cheverud and Buikstra 1981a, 1981b, 1982). Cranial measurements from the macaque collection suggest an average heritability of .32, with lower and higher heritability depending on individual selected traits (Cheverud and Buikstra 1982).

A few analyses have been conducted on human skeletal samples with known or inferred pedigree data. Sjovold (1984) inferred pedigree data based on church records and family-specific decorations painted on the crania from a Hallstatt, Austria skeletal sample. He found heritability ranged from high to low, and variability in heritability was dependent on parent/offspring relationship (mother vs. father). In a more recent study, Sparks (2001) employed European immigrant cranial metric data collected from Franz Boas in order to

calculate cranial metric heritability. Estimates for heritability for head length, head breadth, and bizygomatic breadth produced heritability in the 0.5 range. Konigsberg and Ousley's (1995) study produced heritability estimates for six cranial traits in the .30-.40 range.

Similar heritability studies have been conducted for both cranial and dental nonmetric traits. Studies of nonmetric cranial traits conducted on mice (Grüneburg 1952; Leamy 1974; Self and Leamy 1978) and macaques (Cheverud and Buikstra 1981; McGarth et al. 1984) produced heritability values ranging from .06 to .45 and 0 to 1, respectively. Again utilizing the skeletal sample from Hallstatt, Sjøvold (1984) estimated heritability for 20 common nonmetric traits. He found average heritability ranging from .008 to .954, depending on the trait. Similar to his work with metric traits, Sjovold's study is limited due to small sample sizes and his dependence on nuclear families (Duggirala et al. 1997). Carson's (2006) reanalysis of the Hallstatt material yielded similar results, although with some slight differences. Fifteen of the nonmetric traits Carson used in her analysis had moderate heritability values, but sixteen traits showed heritability of .000.

Whether certain classes of nonmetric traits exhibit a higher degree of heritability than other classes of traits is still debatable. Cheverud and Buikstra (1982) and Ossenberg (1970, 1974) found that hyperostotic traits (i.e., ossification of connective tissue around nerves and bloods vessels) exhibit higher heritability values than foraminal traits (e.g., the presence or absence of nerves, the degree of branching). Carson's (2006) recent study found no statistically significant difference in heritability values between trait classes.

Most early studies on nonmetric dental traits focused on the mode of inheritance. Originally, nonmetric dental traits were proposed to represent simple Mendelian inheritance

(Turner 1967). Subsequent research suggests that while some traits may be purely Mendelian (e.g., interruption grooves), many others represent polygenetic quasicontinuous traits similar to cranial nonmetric traits (Sofear 1970). More recent attention has turned to the heritability of individual dental nonmetric traits. A majority of these studies have focused on fraternal or dizygotic (DZ) and identical or monozygotic (MZ) twin studies (Scott and Turner 1997). Many of these studies produced middle range heritability values (.40 to .80) similar to nonmetric and metric cranial traits.

The research suggests these traits have only moderate heritability (around .30-.40) (although this may be higher or lower depending on individual traits), which must be kept in mind when we are doing these types of analyses (Buikstra et al. 1990). It is important to note, however, that Relethford and Blangero (1990) found that the different heritabilities used in their analysis had little effect on the model's values, suggesting their model is robust even when heritability is not known. Thus, a great deal of research has been generated regarding the general utility of metric versus non-metric traits for the estimation of population distance. Yet, in both cases, heritability appears to be only moderate and neither is free from environmental effects. Consequently, neither class of traits appears inherently better in estimating biological population distances, yet the aforementioned research does suggest that nonmetric traits are sufficiently genetically controlled in estimating biological relatedness among populations.

The decision to use nonmetric traits for this analysis was based primarily on the nature of the skeletal samples. Some of the skeletal samples were in an extremely poor state of preservation. Since metric traits require relatively complete crania, the use of non-metric traits allowed for a greater sample size. Both dental and cranial nonmetric traits were recorded for

two reasons. First, because some of the skeletal samples were poorly preserved, dental traits could be recorded for poorly preserved individuals, when most cranial traits were unobservable. Second, both traits are influenced by environmental factors, some researchers have suggested that skeletal and dental tissues exhibit different responses to the environment (Berry 1976; Griffin 1993), suggesting that the incorporation of different classes of traits may be of some benefit.

Distance Measures

Several measures used to calculate biological distance are commonly found in the anthropological literature (e.g., C.A.B Smith's Mean Measure of Divergence [MMD], Balakrishnan and Sanghvi's *B*2, Mahalanobis D). MMD is the most common distance measure employed for nonmetric traits, starting with it's early inception in the 1960s (e.g., Berry and Berry 1967) and continuing today (e.g., Irish 2005, 2006, 2008; Luckacs and Hempill 1991; Turner 1986; 1987; Sjovold 1977; Sciulli et al., 2008; Sutter and Verano 2007). MMD is a nonlinear dissimilarity measure in that it measures the arc around a hypersphere. Dissimilarities between samples are seen as an approximation for underlying genetic variation between populations. The statistic calls for an angular transformation usually in the form of the Freeman-Tukey (1950) transformation in order to correct for differences in (especially small) sample sizes (Berry and Berry 1967). Due to this transformation, it is possible for the distance between two populations to yield a negative number. Statistical significance is determined by comparison of its standard deviation (Sjovold 1977).

While MMD is ubiquitous for dealing with nonmetric traits, Blangero and Williams-Blangero (1991; see also Konigsberg et al. 1993) developed an adaptation for estimating

Mahalanobis D for polygenic threshold traits. In order to make this conversion, incidences need to be converted to mean liabilities. This conversion is based on the assumption that these "liabilities are normally distributed or can be transformed into normal distributions" (Herrmann 2002:84). These trait liabilities are then used to construct a within-group tetrachoric correlation matrix that can then be used to calculate Mahalanobis D. The equation for this method is:

$$d^2_{ij} = (z_i - z_j)' T^{-1} (z_i - z_j)$$

where *(zi* - zj) is a column vector of differences between threshold values across all traits *z* at sites *i* and *j,* and *T* is a matrix of pooled within-group tetrachoric correlations between traits. The resulting measure produces the minimum possible distance between groups (Blangero and Williams-Blangero 1991).

Mahalanobis distance using a tetrachronic correlation matrix adjusts for phenotypic correlations between traits and thus removes any potential biases from trait intercorrelation. This is not the case with MMD, which cannot account with trait intercorrelation. As a result, when calculating MMD, traits first must be analyzed for correlations and then removed from the subsequent analysis. Furthermore, Mahalanobis distance is a Euclidian distance, as opposed to MMD, which, as stated, is nonlinear distance. This fact is important because it is not possible to estimate F_{ST}. and **R** matrix using a nonlinear distance measure. As will be discussed in the following section, these estimates are important components of estimating biological distance within a population genetic model (Konigsberg 2006). Although Schilllaci et al. (2009:239) used measurements Multidemensional Scaling (MDS) of plotted samples in three-dimensional space as a proxy for Relethford's R matrix (r_{ii}), the use of Mahalanobis was chosen for this study because of its more straightforward means of estimating the R matrix and F_{ST}.

Wright's F_{ST}

Sewall Wright's (1943, 1951, 1978) *F* statistics are nested hierarchies of inbreeding coefficients. The measures of *F*-statistic include F_{IS}, F_{ST}, and F_{IT}, and are related to the amount of heterozygosity within various levels of the population structure. F_{IS} is the measure of inbreeding within a subpopulation and F_{IT} is the measure of inbreeding across a population. Most relevant to the study of gene flow is F_{ST}, which provides a standardized measure of subpopulation genetic variance and provides a generalized measure for genetic differentiation between these subpopulations (or in the case of this study between archaeological skeletal samples) (Konigsberg and Buikstra 1995; Wright 1969).

Relethford and Blangero (1990) distinguish between minimum, phenotypic F_{ST} and genetic F_{ST}. Assuming phenotypic and genetic variance-covariance matrices are proportional and equal relative census size across samples, the minimum F_{ST} is proportional to the genetic F_{ST} for moderate to high trait heritabilities. Based on this assumption, Konigsberg and Ousley (1995) derived the formula for the relationship between genetic F_{ST} and minimum, phenotypic F_{ST} as:

$$F_{\mathrm{ST\,(G)}} = \frac{F_{ST(P)}}{F_{ST(P)} + h^2(1 - F_{ST(P)}}$$

For this study F_{ST} is derived from the C matrix and is discussed in further detail below.

F_{ST} values have been used as an indirect measure of the number of migrants received within a population for each generation. Wright (1951) introduced the infinite island model in which a single population is divided into an infinite number of subpopulations with equal migration between them. The infinite island model predicts that "if a long list of assumptions is

true, the variance of gene frequencies among different populations should be related to the number of migrants which come into each population each generation" (Whitlock and McCauley 1998) or

$$F_{ST} \approx 1/(4N_e m + 1)$$

where N_e is the effective population size of each population and m is the migration rate between populations. It is the assumptions underlying the equation, however, that can be problematic. First, the model assumes that there is no selection or mutation and that drift and gene flow are at equilibrium. Furthermore, the underlying assumption is that migration is constant with and each population receives an equal number of migrants and the migration is completely random with no spatial structure (Whitlock and McCauley 1998). The latter assumption is particularly unrealistic especially among human populations were both geographic and cultural factors can serve as boundaries for limiting gene flow among these populations.

Methodological Approaches

A range of multivariate analyses are used to estimate biological distance and tend to be directly tailored to the types of questions that are being addressed here. The theoretical basis underlying these analyses falls into two categories: *Model-bound* and *Model-free* approaches (Relethford and Lees 1982). Model-free approaches examine biological convergence and divergence between and among populations regardless of cause. In other words, Model-free approaches are done *free* of a direct application of any genetic model (Relethford and Lees 1982). These approaches usually fall into two categories: differentiation (i.e., within group

population differences) and comparative (i.e., comparison of biological distance measure with other factors such as geographic location) (for full review see Relethford and Lees 1982).

Methodological advancement in biological distance studies has seen the rise of more formal model-bound approaches that are based on population genetic theory rather than archaeological evidence (Konigsberg 2006). A model-bound approach uses the estimation of population genetic parameters to estimate levels of gene flow and biological differentiation. Admixture studies are one such example of a model-bound approach discussed by Relethford and Lees (1982), but when this article was published, this approach was rare in bioarchaeological contexts. What sets model-bound approaches apart from other earlier studies that employed population genetic theory such as Wright's isolation by distance model (e.g., Konigsberg 1988, 1990) is that model bound approaches allow for the direct estimation of genetic parameters (Konigsberg 2006)

The Relethford-Blangero (1990) model has become popular in model-bound analyses. This method is more mathematically complex and requires more assumptions than model-free procedures. Despite greater mathematical complexity, this approach appears to be more robust because of its ability to estimate population biological differentiation and its grounding in population genetic theory (Steadman 1998). The Relethford-Blangero model is an extension of the Harpending-Ward (1982) model, in which quantitative traits can be used to construct a **R**-matrix (a standardized variance-covariance matrix) and to compute Wright's F_{ST} to obtain genetic parameters and estimate gene flow.

A "co-divergence" matrix (written as **C**) first needs to be calculated to construct an **R**-matrix and a F_{ST} value,:

$$C=-0.5\ (I-1w^{t})\ D^{2}\ (I-1w^{t})^{t}$$

where *w* is equal to a column vector of the proportion of the effective population size, *I* is an identity matrix, *1* is a column vector of ones equal by the length of the number of populations, and D^2 is the squared distance (based on *t* traits) (Konigsberg 2006; Herrmann 2002) . The codivergence matrix is basically an estimation of the variance around the centroid (Konigsberg 2006).

F_{ST} values can then be derived from this C matrix described by Relethford and Harpending (1994) as:

$$F_{st}= w^{t}\ diag\ \{C\}/\ 2t + w^{t}\ diag\ \{C\}$$

where diag (C) is the diagonal of the C matrix that has been converted into a column vector and t is the number of traits (Konigsberg 2006). The equation is based on the assumption that heritability equals 1, meaning pure genetic inheritance with no environmental effects. As was discussed above full heritability can not be assumed for nonmetric traits. Thus, it must be kept in mind that the equation for the F_{ST} is simply a minimum degree of genetic differentiation. If heritability is lower than 1 the F_{ST} will be a larger value (Relethford 1994).

The R matrix can then be calculated using and C by:

$$R=C(1- F_{ST})/2t$$

This R matrix can then be used to calculate distances of populations or subpopulation from the centroid (i.e., average of all population heterozygosity) (represented on the diagonal of the R-matrix) and residuals (differences between the observed and expected heterozygosity) for each population (Konigsberg 2006). Gene flow results in greater heterogeneity (or heterozygosity) within populations and greater homogeneity between populations. Genetic drift

(from isolation) has the opposite effect. This type of Model-bound approach has been used for both modern day populations (Relethford and Blangero 1990, Relethford 1991) and archaeological "populations" using both metric (Steadman 1998, Langdon 1995, Nystrom 2006) and nonmetric traits (Herrmann 2002; Godde 2009).

Phenotypic Approaches to the Study of Postmarital Residence Patterns

Reconstructions of kinship practices and postmarital residence practices among Mississippian communities have in large part been based on ethnographic analogies of modern Southeastern tribes. Kinship among ethnohistorical Southeastern native groups was matrilineal. In such a system the father is not the most important male figure in a child's life. Rather, inheritance and responsibility for the child's welfare is associated with the child's maternal uncle (Hudson 1976). The kinship structure of Southeastern tribes was made up of matrilineal exogamous clans (Knight 1990). In matrilineal societies males tend to move to their wives villages (uxorilocal postmarital residence).

Biological distance studies can be particularly useful in the interpretation of postmarital residence patterns. The publication of Lane and Sublett's (1972) article for nonmetric traits and the subsequent publication of Spence's study (1974) for metric traits demonstrated that in theory postmarital residence patterns could be ascertained through biological distance studies. They argued that the sex with the greater migration rate would exhibit greater phenotypic heterogeneity and visa versa.

In practice, however, this argument is problematic (Kennedy 1981; Konigsberg 1987, 1988). Although this supposition may be true in the static past, researchers demonstrated that this argument only holds true for the first generation because alleles are randomly assigned to sexes in the next generation (Konigsberg 1987, 1988; Konigsberg and Buikstra 1995). Konigsberg (1988), demonstrating through multiple simulations, suggests that rather than focus on between-group variation (as in Lane and Sublett's study), the focus should be placed on within-group variation. Thus, the sex with the lower mobility within a mating network will have lower within-group trait variation relative to the more mobile sex. In order to examine postmarital residence patterns, Konigsberg (1988, 1987) examined nonmetric traits from samples dating from the Middle Woodland through Mississippian Period sites in West Central Illinois (the Gibson, Klunk, and Schild). Konigsberg used a ratio of the determinant of covariance matrix ($|C|$) for males and females ($|C(F)|/|C\ (M)|$) to suggest a patrilocal postmarital residence pattern during the Woodland Period that perhaps transitioned to matrilocal residence during the Mississippian Period. A recent study of mitochondrial DNA (mtDNA) however, has produced conflicting results for the Klunk site in which males demonstrated greater mtDNA diversity suggesting matrilocal postmarital residence (Bolnick and Smith 2007). Bolnick and Smith (2007) give different explanations for the inconsistent finding between the morphological and genetic diversity findings, but suggest that instability in mate exchange networks and postmarital residence patterns during the Woodland Period may have produced such differing results.

This type of analysis is important for studies of chiefdom societies because postmarital residence patterns can play a significant part in the formation and structure of alliances and factional competition (c.f., Chapter IV). Such research may lead to greater insights of the

workings of kin networks in Mississippian polities since, "marriage arrangements were important mechanisms by which status and power relations were acknowledged, alliances were sealed, and administrative structures filled in Southeastern chiefdoms" (Anderson 1994:70).

Previous Biological Distance Studies

While issues of morbidity, mortality, and trauma have been extensively discussed within the study region (e.g., DiGangi 2008; Vogel 2008; Betsinger 2002; Boyd 1984; Harle 2003; Hatch and Geidel 1983; Hatch et al. 1983; Smith 1982, 1986, 1987, 2003; Milner et al. 2000; Humpf 1995; Blakely and Matthews 1990; Williamson 1998, 2000), analysis of population structure has received less attention. Earlier studies focused on racial typologies. William Funkhouser (1938) analyzed the skeletal material recovered from Norris Basin, including the Cox site. One of the goals Funkhouser (1938:244) described was to "attempt to construct an anthropometric picture of the aborigines which inhabited this region." This type of analysis continued with other large-scale WPA/TVA reservoir projects. For example, Kneberg (Lewis et al. 1995) used her considerable artistic talent to reconstruct representative examples of "physical types" from Mouse Creek, Dallas, and Historic Cherokee crania. The goal of these studies was to reduce variation of populations into select racial varieties, in essence as Milner and Jacobi (2006:124) write for the "identification of ideal types, not the population-oriented analyses of morphological variation that are so common today."

Wright's (1974) master's thesis was the first to use Dallas skeletal samples to examine biological distance within a population perspective framework using multivariate statistical techniques. Wright's specific goal was to compare Dallas cranial traits with historic Cherokee and Muskogee populations. Wright concludes that Dallas communities were morphologically

similar to Muskogee populations. When considering the results of Wright's study, several issues must be addressed. While the Cherokee samples used in her analysis came from historic Cherokee sites in the Tellico Reservoir, Wright used prehistoric material from Georgia and Alabama as a proxy for the Muskogee population. Furthermore, due to the fragmentary nature of the skeletal series, the sample sizes are extremely small.

Helmkamp's (1985) biological distance study for several Late Woodland/Early Mississippian and Dallas/Mouse Creek samples suggests biological affinity between clusters of Late Woodland burial mounds. Phenotypic skeletal traits appeared more heterogeneous between groups when compared with those of later Mississippian populations. Helmkamp interprets this as a change in sociopolitical interactions in which social boundaries become more permeable during the Later Mississippian period.

Boyd and Boyd (1991) compared cranial metric traits between Dallas Phase (represented by the Dallas and Toqua sites), Mouse Creek Phase (represented by the Rymer, Mouse Creeks and Ledford Island sites), and Middle Tennessee (i.e., Middle Cumberland) skeletal samples in order to test the hypothesis that Mouse Creek sites may represent an in-migration of Middle Cumberland groups. The results do not confirm a biocultural affinity between Mouse Creek and Middle Cumberland groups, contra to an earlier study (Berryman 1975). All three groups demonstrated greater inter-group heterogeneity among females than males. While not conclusive, the results of greater variation between females may reflect matrilocal postmarital residence patterns.

Griffin (1993) utilized a series of nonmetric traits to compare postcontact southeastern coastal populations with other prehistoric skeletal populations from the interior Southeast,

including Ledford Island. The ethnically identified Guale from Spanish mission cemeteries represented the postcontact sample. Griffin identified significant intergroup variation within the Guale sample. The Irene mound sample, thought to represent the prehistoric antecedent to the Guale culture, was morphologically more similar to the interior Ledford Island sample than to historic Guale samples.

Griffin and coworkers (2001) compared nonmetric traits of these coastal mission populations with prehistoric interior Georgia (the King and Little Egypt sites) and coastal (Irene Mound) Georgia, North Carolina (Town Creek, Warren Wilson, and Coweeta Creek), and Tennessee (Ledford Island) sites. Cluster analysis and Smith's MMD scores suggest that the King, Ledford Island, and Irene samples are more biologically similar. The North Carolina groups also tended to cluster closer together. Surprisingly the analysis suggests that the Barnett Phase King and Little Egypt sites were biologically distinct. Although the focus of the study was to analyze mission populations with respect to prehistoric populations, it is the findings in regards to the prehistoric interior population clusters that are of particular interest. The North Carolina samples are generally considered prehistoric ancestors to historic Cherokee populations. The study appears to concur with Wright's study that Tennessee prehistoric populations lack biological affinity to historic Cherokees. Although isolation by distance was not explicitly tested, the study samples tended to cluster together based on broad geographic areas. The incorporation of other East Tennessee sites has significant bearing on this discussion since it allows for a more nuanced picture of regional interactions as opposed to large-scale geographic trends.

Stojanowski (2005) also studied mission samples (working within a model bound framework) to examine biological distance of dental metric traits from different periods of pre- and post-contact Apalachee and western Timucua culture. The results suggest that pre-contact and early Spanish mission populations were more homogenous among groups and more biologically distinct from interior groups than later mission samples. Stojanowski suggests the result of a long missionization period may have led to the disruption of previous cultural boundaries and to greater population aggregation.

In a more recent study utilizing Dallas and Mouse Creek samples, Weston (2005) analyzed dental nonmetric traits for three sequential sites (Hixon, Dallas, and Rymer) within the Chickamauga Basin. Employing Smith's MMD, she examined whether biologically continuous populations occur at these sites. Weston's findings mirror that of Boyd and Boyd (1991), of shared biological affinity between Mouse Creek and Early and Late Dallas communities.

While occurring outside this study's region, several previous biological distances studies specifically address the intersection of population structure, interregional exchange networks, and cultural boundaries. Schillaci and Stojanawski (2003) argued that biological distance patterns in their study of sites in the prehistoric Southwest suggest that mate exchange could not be explained by isolation-by-distance alone. They suggest that a ceremonial exchange network may have influenced the exchange of mates in the region. Biological distance studies as means of exploring cultural identity and the process ofethnogenesis also have been especially prolific in South American research (e.g., Nystrom 2009, Sutter 2009, Blom et al. 1998). Biological distance studies outside the southeastern United States region demonstrate the utility of using

population genetic structure as a means of exploring aspects of the construction of cultural identity, regional integration, and the process of ethnogenesis.

Chapter V: Materials and Methods

Sample composition and sizes, as well as trait selection, are significant factors in any study of biological distance. This chapter provides a discussion of these variables as they pertain to this study of biological distance in the proposed Coosa chiefdom. Also included here are the statistical calculations for the analytical methods presented in Chapter Four.

Samples

The sites selected for this study represent late occupation Mississippian sites from regional areas that have been reconstructed by several researchers as representative of the Coosa polity. Table 5-1 provides a list of sample sizes for the selected sites. Nonmetric data from the Brewster Phase Leake site (9BR2) and the Mouse Creek Phase Ocoee site were also collected, but these sites were eliminated from further analysis because the sample sizes are very small (sample sizes n=11 and n=15, respectively). Age and sex estimates made by previous researchers for the individuals in these samples were used when possible. Several of the site samples (e.g., Ledford Island) have been aged and sexed by several investigators (i.e., Kneberg, Boyd, Smith) with very few changes in estimates). When not available, new individual age and sex estimates were assessed by the author using standard osteological methods outlined in Buikstra and Ubelaker (1994). Ages were classified into four groups: adolescent (12-19 years), young adult (20-30 years), middle adult (30-50 years), and old adult (50+).

Subadults generally are excluded from biological distance studies because age can be an important causative factor in the presence of traits (Buikstra 1976; Saunders 1978; Self and

Table 5-1 Skeletal Samples used in the Analysis

	Males	Females	Unidentified	Total
David Davis (40HA301)	19	23	57	99
Cox (40AN19)	68	59	36	163
Fains Island (40JE1)	77	78	69	224
Ledford Island (40BY13)	58	110	113	281
King (9FL5)	34	28	68	130
Little Egypt (9MU102)	10	9	7	26
			Total	923

Leamy 1978). This factor is especially the case during the juvenile growth period and can lead to the formation of hyperostotic traits (due to bone ossification) and the loss of hyperostotic traits (due to incomplete bone formation). Because of these problems, only individuals estimated to be older than 12 years of age are included in this study.

Non-metric Trait Selection

Nonmetric traits were chosen for this analysis because many of the samples are fragmentary. Traits selected for this study are based on low intra-observer error, preservation and dental wear factors, and general ease of observation. A total of 27 dental traits were recorded, the majority of which were recorded using an ordinal scale based on the Arizona State University (ASU) Dental Anthropology System set forth by Turner et al. (1991). This system uses plaques that provide physical representations of minimal and maximal trait expression and various gradations between. Table 5-2 presents the list of dental nonmetric traits used for the analysis of the samples in this study.

Table 5-2: Dental Traits and Coding used in the Study

Trait	Teeth Observed	Presence
Shoveling	upper incisors	>2
Double Shoveling	upper incisors	>1
Interruption Groove	central incisors	>1
Metaconcule Cusp	upper molars	>1
Carabelli's Cusp	upper molars	>1
Parastyle Cusp	upper molars	>0
Hypocone	upper 2nd and 3rd molars	>2
Premolar Root	lower premolars	>1
Lingual Cusp	lower premolars	>1
Peg-shaped incisors	upper lateral incisors	>0
Peg-shaped molars	upper 3rd molars	>0
Groove pattern	lower 1st and 2nd molars	X and + = 1
Protostylid	lower molars	>1

A series of 22 traits cranial traits also was examined. These traits derive from previous studies by Konigsberg et al. (1993) and Herrmann (2002), and are described fully in Buikstra and Ubelaker (1994). Traits are dichotomized based on simple presence or a combination of traits. The list of cranial traits used in this study along can be seen in Table 5-3.

Bilateral Traits

The majority of nonmetric variables occur bilaterally, that is, a trait expressed on the right side will mirror the trait on the left side. Traits are occasionally asymmetrical. Some authors suggest that expression may be developmentally progressive and that bilaterial expression increases with developmental age (Saunders 1978; Winder 1981; Korey 1980). Others suggest that environmental stress may lead to trait asymmetry (Korey 1980; Trinkaus 1978). Rare traits within a population do seem to exhibit a tendency for unilateral trait expression (Halligrimsson et al., 2005).

Three common procedures exist for handling the possibility of unilateral expression. One method, total side method, scores all traits for each side. The problem with this procedure is that it unnecessarily inflates sample size and introduces redundant information (Buikstra 1976). Another method is called the individual count method, in which trait occurrence is recorded from one side of each individual. Two different procedures are used for the individual count method; some researchers advocate recording one side for bilateral traits through random selection (e.g., Buikstra 1976; Konigsberg 1987; Konigsberg et al., 1993; Herrmann 2002). Other researchers recommend observing both sides and recording only the side with the maximum expression for

Table 5-3: Bilateral and Midline Traits used in the Analysis

Midline Traits	**Presence**
Metopic Suture	Complete
Bragmatic Bone	Present
Apical Bone	Present
Inca Bone	Complete, single bone, Bipartite, Tripartite
Flexure of Sagittal Sinus	Left/Transverse
Bilateral Traits	
Supraorbital Notch	Present
Supraorbital Foramen	≥1/2 occluded
Multiple Supraorbital Foramina	>1
Infraorbital Suture	=Partial or Complete
Multiple Infraorbital Foramina	>1
Multiple Zygomatic-Facial Foramina	>1
Ossicle at Asterion	Present
Parital Notch Bone	Present
Lambdoidal Ossicle	Present
Masto-Occipital Ossicle	Present
Condylar Canal	Patent
Divided Hypoglossal Canal	Complete
Auditory Exostosis	Present
Multiple Mastoid Foramina	>1
Accessory Lesser Palatine Foramen	Present
Multiple Mental Foremina	>1
Mylohyoid Bridge	Complete bridge

each trait (Turner et al. 1997; Griffin 1993). The maximum expression strategy has the possibility for under representing bilateral trait frequencies for poorly preserved samples (Green et al., 1997). In this study, one side was randomly chosen. If only one side was present because of poor preservation, then this side was recorded. This procedure reduced artificial inflation of sample size or trait expression, while not significantly reducing the sample size because of poor preservation.

Recordation

The data were directly recorded into an Access database. The database included site number, burial number, age, sex, and cranial and dental trait observations. Skeletal traits were scored based on the illustrations and descriptions provided by Buikstra and Ubelaker (1994) for cranial traits and descriptions described by Turner et al. (1991) and Arizona State University dental casts. For the final analysis, dental and cranial traits were then dichotomized as present or absent following standard schemes outlined by Turner (1985, 1987) for dental traits and Herrmann (2002) for cranial. Tables 5-2 and 5-3 provide the code reclassification for all dental and cranial traits to presence or absence.

Every individual within each site sample was recorded if at least one trait was observable. Absent traits were coded as "0" and present traits were coded as "1". Unobservable cranial and nonmetric traits were coded "9". The Access database is on file at the University of Tennessee Frank H. McClung Museum.

Estimation of Age and Sex Effects

Research demonstrates that there are significant age and sex effects in the occurrence of nonmetric traits both within and between populations (Konigsberg 1987; Buikstra 1976; Corruccini 1974; Kennedy 1981; Richtmeier et al. 1984; Powell 1995; Rhoads 2002). Because population comparisons require sexes and ages to be pooled for statistical analysis, elimination from the sample of traits that may have statistically significant age and sex effects is important. Multiple chi-square analyses help determine significant correlations between age, sex, and specific traits. Chi-square analysis were performed for this study using the NCSS statistical package (Hintze 2006).

Distance Measures

Calculation of Mahalanobis D^2 utilizes trait threshold values and a pooled within-group tetrachoric correlation matrix. The tetrachoric correlations are estimated using bivariate probit analyses. Threshold vectors and the tetrachoric correlation matrix for each site sample were then used to construct the Mahalanobis D^2. The equation for this method is as follows:

$$d^2_{ij} = (z_i - z_j)' T^{-1} (z_i - z_j)$$

where $(zi - zj)$ is a column vector of differences between threshold values for trait z at sites i and j, and T is a matrix of pooled within-group tetrachoric correlations between traits. A tetrachoric correlation is simply a correlation between two binary traits. For all combinations of traits in this study, tetrachoric correlations for pairs of traits were first computed within each group, and then pooled incorporating sample size to determine the weighted average correlation.

These threshold values and tetrachoric correlation matrix were computed using Fortran code written by Lyle Konigsberg.

A principal coordinates analysis (PCO) was then computed from the distance matrices. The PCO was calculated in "R" (Ihaka and Gentleman 1996) using the classic multidimensional scaling with the "cmdscale" package. Similar to principle component analysis, PCO reduces dimensionality by creating new coordinates. These new coordinates can be plotted to make visualization of relationships and clustering of the samples easier. The first two eigenvectors obtained from the PCO were then imported into NCSS statistical package (Hintze 2006) to produce the scatterplots.

Matrix Correlations

Both temporal and spatial factors can influence genetic distances (or biological distance). Konigsberg (1990) demonstrated that if mating networks are geographically patterned at a fixed temporal period, genetic distance increases across space (i.e., isolation-by-distance). The same phenomenon holds true for time, if one controls for space (e.g., within the same village). Since this study of the Coosa province deals with relatively contemporary occupations, the focus here is on the potential for geographical distance to influence biological distance. Geographic distances for the sites in the study were obtained by plotting the sites in ArcGIS and calculating straight-line distance matrices using an ArcGis extension package *Hawth's Analysis Tools* (Beyer 2004). Results from this analysis are given in Table 5-4. Calculations for river mile distances were considered. The East Tennessee sites are all situated on major tributaries of the Tennessee

Table 5-4: Geographic Distance Matrix in Kilometers.

	Ledford Island	Fains Island	Cox	David Davis	Little Egypt	King
Ledford Island	0					
Fains Island	148	0				
Cox	97	67	0			
David Davis	46	193	143	0		
Little Egypt	79	194	163	63	0	
King	131	261	225	93	68	0

River. However, there is no obvious or direct route from these sites to Little Egypt and King and several possible routes could have been taken. Thus, only straight-line distances were taken.

A Mantel matrix permutation test is used to examine the correlation between geographic distance and biological distance. A Mantel test is a regression in which the variable distance or dissimilarity matrices summarize pairwise similarities among sample locations. In other words, the Mantel test determines whether samples from a particular environment or distance also tend to be similar in regards to the dependent (biological) variable (Smouse and Long 1991). The Mantel test between the straight geographic distance and genetic distance matrices was run using MANTEL v. 3.1 software written by John Relethford. The test utilized 999 permutations.

R Matrix and F_{ST} Calculations

Further statistical analysis are based on the Relethford and Blangero (1990) model outlined in Chapter Four, in which an R matrix and F_{ST} values are calculated using estimated biological distance matrices. Equations for the R matrix, C, matrix and F_{ST} can be found in the Chapter Four.

The R matrix calculates distance of population or subpopulations from the centroid and residuals for each population. Graphical representation of the centroid is represented as a regression line; populations that fall far above the line have higher heterozygosity (higher than expected under geneflow) while those below the line have less than expected heterozygosity. F_{ST} is the average weighted distance to the centroid and represents biological differentiation. The R matrix and F_{ST} were calculated in "R" (Ihaka and Gentleman 1996, http://www.r-project.org/). Values along the diagonal of the R matrix represent the biological distance from the centroid. F_{ST} represents the average weighted distance to the centroid.

Finally, a modified Relethford-Blangero analysis was conducted in order to estimate the level of gene flow for the sites used in the analysis. Within the Relethford-Blangero model the expected average phenotypic variation within a population is

$$E\overline{V}_{Gi} = \overline{V}_{Gw}\frac{1-rii}{1-r_0}$$

Where $E\overline{V}_{Gi}$ is the pooled within group phenotypic variation among populations, rii is the distance of population *i* from the centroid, and r0 is the $F_{st.}$ The residual is obtained by subtracting the observed average phenotypic variation ($\overline{V}_{Gw} - E\overline{V}_{Gi}$) (Relethford and Harpending 2005). A residual that is greater than average residual indicates a higher rate of gene flow than the average while a lower than average residual indicates greater homogeneity (Relethford and Blangero 1990). This estimation is generally performed with continuous data and calculations are frequently performed in the RMET 5.0 authored by John Relethford (Relethford, et al. 1997). Godde (2009) recently adapted the Rutherford-Blangero model in order to estimate $\overline{V}_{GW}$ for categorical data. A word of caution most be noted when using the

Relethford-Blangero model for discrete traits. The Relethford-Blangero model was specifically designed for continuous data and requires a an average (across traits) within-group variance. This is not possible for discrete traits because the estimation of tetrachoric correlation is based on the assumption that variance is equal to 1.0. In this analysis $\overline{V}_{GW}$ is calculated by the trace of the additive phenotypic covariance matrix divided by the number of traits. The covariance matrices were calculated for the dental nonmetric traits using the "pairwise.complete.obs" option in the statistical program "R" (Ihaka and Gentleman 1996). The pairwise option works well when dealing with missing data. While, as presented here, the Relethford-Blangero model has been modified to deal with discrete traits, the results can be problematic and must be viewed with caution.

Chapter VI: Results and Discussion

The biological distance analysis produced several interesting results relevant to interactions among groups in the proposed Coosa chiefdom. In this chapter, the basic descriptive analyses and preliminary data screening are first presented, followed by the results of more detailed statistical analysis of the population structure for the sites and comparison of geographical distances between the sites. Intra-site comparisons based on sex and its implications on post-marital residence patterning are then discussed. When viewed together all of these results offer insights into biological as well as possible social interactions among towns within the proposed Coosa Chiefdom. The results are discussed in relation to the methods presented in Chapter V.

Quantitative Analysis and Data Screening

The study sample included 923 individuals. A total of 49 traits was used in the analysis -13 nonmetric dental traits (totaling 27 when multiple teeth are added) and 5 midline and 17 bilateral nonmetric cranial traits. These individuals represent all individuals in the collections from the study sites who were aged greater than 12 years and who had at least one identifiable nonmetric trait.

Trait Frequencies

The frequencies of trait occurrence were calculated for each sample after being dichotomized as present or absent, as outlined in Tables 5-2 and 5-3 and according to standard procedure (Turner 1985, 1987; Sjovold 1977; Herrmann 2002). These

frequencies provide data for a cursory qualitative discussion of the variation of traits among sites and these results can be found in Appendix A.

Trait frequencies also allowed identification of traits with fixed (100% frequency) or low (0%) frequencies that should not be used in the statistical analysis. Only one individual from the King site contained an unfused metopic suture. A bragmatic bone also only occurred in four individuals for the entire pooled populations. The traits multiple mandible foramina, inca bone, metaconule cusp (UM1), carabelli's cusp (UM1,UM2, UM3), parastyle (UM1, UM2, UM3), peg-shaped lateral incisor, peg-shaped molar, and protostylid (LM1, LM2) occurred in low frequencies throughout the entire pooled sample.

Preservation of particular traits also greatly varied in the study sample. Although there was some variation among sites, the least observable traits in general were the accessory lesser palatine Foramen, parital notch bone, and asoteric bone. These traits were excluded from the final analysis. Postcondyler canal and mastoccipital ossicle were also removed from the analysis because these traits were rarely observable in the David Davis site samples. Shovel shaped and double shoveled incisors were removed from the analysis because they occurred in close to fixed frequencies.

Age and Sex Effects

Some nonmetric traits can be age and sex dependent. With the possible result that differences in trait frequencies may be an artifact of demographic differences among sites, controlling for this dependency is therefore important. An assessment of age and sex effects for discrete trait frequencies was analyzed using the pooled sample following

Konigsberg (1987). The chi-square was used to examine these effects. Three traits exhibited significant sex effects. Two of these traits (auditory exostosis and hypocone (UM2) were linked with males and one (infraorbital Suture) was more associated with females (Table 6-1). The male linked traits most likely represent typically sexually dimorphic regions of the mastoid and molars. Results of the Chi-square analysis for age effects can be seen in Table 6-2. Amelogensis (enamel production) ceases to remodel after crown development, so dental nonmetric traits are not age sensitive as they are with cranial nonmetric traits. Accordingly, an analysis of age effects was only conducted for the cranial nonmetric traits. Only one trait (multiple infraorbital suture) was significantly dependent with age. Age and sex effects can be difficult to interpret, so to err on the conservative side, all traits that showed significant age or sex correlations were removed from further analysis.

Final Trait Selection

For dental nonmetric multivariate analysis, Turner and coworkers (Turner 1997; Turner et al. 1991) recommend using a "key" tooth because it is likely that the same suite of genes controls phenotypic expression of a particular trait within the same tooth class. As a result, the use of one key tooth for each trait avoids introducing redundancy within the analysis. When possible, particular key tooth selection for this study followed Turner and colleagues' recommendation. Exceptions were made for a few traits where the suggested key tooth was previously removed because of low frequency or age and sex effects as discussed above. Table 6-3 lists the final roster of 10 cranial and eight dental nonmetric traits used in the multivariate analyses

Table 6-1: Results of Chi-square analysis of trait and sex associations

Trait Code	*Trait*	X^2	*p-value*
SN	Supraorbital Notch	0.69	0.40
SF	Suprorbital Foramen	0.04	0.84
MSF	Multiple Suprorbital Foramen	2.00	0.36
IS	Infraorbital Suture	11.40	<0.01
MIF	Multiple Infraorbital Foramen	1.74	0.19
MZF	Multiple Zygomatic Facial Foramen	0.02	0.96
AO	Appical Ossicle	0.20	0.65
SSF	Sinus Flexure	0.78	0.37
AB	Astrionic Bone	3.60	0.06
PN	Parietal Notch Bone	0.60	0.43
LO	Lambdoidal Ossicle	0.02	0.90
MO	Mastooccipital Ossicle	0.01	0.92
PC	Post-condylar Canal	3.47	0.06
DH	Divided Hypoglossal Canal	0.00	0.98
AE	Auditory Exostosis	28.35	<0.01
MMF	Multiple Mastoid Foramen	0.48	0.49
MF	Accessory Lesser Palatine Foramen	2.37	0.12
MB	Mylohyoid Bridge	0.09	0.76
SUI1	Shoveling UI1	1.61	0.45
SUI2	Shoveling UI2	0.04	0.85
DSUI1	Double Shoveling UI1	0.58	0.45
DSUI2	Double Shoveling UI2	0.00	0.96
IGI2	Interruption groove UI2	0.68	0.41
MUM2	Metaconcule UM2	0.37	0.83
MUM3	Metaconcule UM3	4.39	0.22
CUM1	Carabelli's cusp UM1	3.42	0.18
PUM3	Parastyle UM3	0.01	0.92
HUM2	Hypocone UM2	9.97	0.01
HUM3	Hypocone UM3	2.75	0.10
PRLP1	Premolar Root LP1	2.92	0.09
PRLP2	Premolar Root LP2	2.79	0.09
LCLP1	Lingual Cusp LP1	0.05	0.83
LCLP2	Lingual Cusp LP2	1.30	0.52
GPLM1	Groove pattern UM1	0.55	0.46
GPLM2	Groove pattern UM2	0.11	0.73
PLM3	Protostylid UM3	0.03	0.86

Table 6-2: Results of Chi-square analysis of trait and sex associations

Trait Code	X^2	*p-value*
SN	3.73	0.29
SF	3.07	0.38
MSF	14.19	0.01
IS	5.61	0.13
MIF	6.29	0.39
MZF	0.22	0.97
AO	1.32	0.73
SSF	0.71	0.87
AB	7.14	0.07
PN	1.80	0.61
LO	6.35	0.10
MO	2.13	0.55
PC	4.26	0.23
DH	1.45	0.69
AE	5.20	0.16
MMF	2.16	0.54
MF	2.78	0.43
MB	2.57	0.46

Table 6-3: Final Traits Used in the Analysis

Trait Code	*Trait*
Cranial Traits	
SN	Supraorbital Notch
SF	Supraorbital Foramen
MIF	Multiple Infraorbital Foramen
MZF	Multiple Zygomatic Facial Foramen
AO	Apical Ossicle
SSF	Sinus Flexure
LO	Lambdoidal Ossicle
DH	Divided Hypoglossal Canal
MMF	Multiple Mastoid Foramina
MB	Mylohyoid Bridge
Dental Traits	
IGI2	Interruption groove UI2
CUM1	Carabelli's cusp UM1
MUM2	Metaconcule UM2
HUM3	Hypocone UM3
PRLP1	Premolar Root LP1
LCLP2	Lingual Cusp LP2
GPLM2	Groove pattern UM2
PLM3	Protostylid UM3

Intersite Comparison: Nonmetric Distance Measures

The pooled sites distance measures enabled comparisons of biological affinities among the study sites. Each trait class was first compared separately then combined. This procedure made it possible to compare differences between the two major analytical categories, dental and cranial nonmetric traits. The results for the cranial and dental threshold values can be seen in Tables 6-4 and 6-5. Tables 6-6 and 6-7 show the results of the tetrachronic correlation matrix. Correlations range between -.89 and .47 for cranial traits and -.27 and .31 for dental traits. The tetrachronic correlations were used to construct the distance measures shown in Tables 6-8, 6-9, and 6-10. In order to standardize the three Mahalanobis distances (cranial, dental, and all traits combined) the distances were divided by the total number of traits used in each analysis. Mahalanobis distances range from .043 (Cox and Fains Island sites) to .620 (David Davis and Little Egypt sites) for cranial traits, 0.029(Ledford Island and Cox sites) to 0.456 (Cox and King sites), and 0.043(Cox and Ledford Island) and 0.493 (David Davis and Little Egypt) for all traits combined. For both dental and cranial traits, the smallest biological distances are between the Ledford Island (BY13), Cox (AN19) and Fains Island (JE1) samples. The greatest distances are between David Davis (HA302) and Little Egypt (MU102) samples for the cranial and combined traits distance matrices. Some caution must be used regarding the results of the distance matrix for the cranial traits. Both the David Davis and Little Egypt samples were highly fragmentary and many traits were unobservable. For the Little Egypt sample, poor preservation is coupled with a low sample size. For dental traits, the greatest biological distance is between Cox and King.

Table 6-4: Cranial Nonmetric Traits Threshold Values

	SN	SF	MZF	MIF	AO	SSF	LO	DH	MMF	MB
AN19 -	0.05	0.31	-0.59	-1.53	-0.55	-1.01	0.54	-1.11	-1.43	-0.37
BY13	0.29	0.03	-0.40	-1.29	-0.48	-1.09	0.19	-0.90	-1.32	-0.44
HA301	0.33	-0.20	-0.74	-1.53	0.32	-1.10	0.43	-1.34	-1.10	-1.02
JE1	0.16	0.18	-0.58	-1.43	-0.49	-1.00	0.83	-1.20	-1.34	-0.83
FL5	0	0.35	-1.05	-1.91	-0.50	-0.98	0.27	-1.03	-0.96	-1.068
MU102 -	0.25	-0.08	-0.14	-1.53	-1.28	-1.22	0.43	-0.97	-1.54	-1.33

Table 6-5: Dental Nonmetric Traits Threshold Values

	IGI2	MUM2	CUM1	HUM3	LCLP2	PRLP1	GPLM2	PLM3
AN19	-0.45	1.31	-1.50	-0.05	-1.02	-1.04	-1.705	-0.05
BY13	-0.50	1.50	-1.50	-0.32	-1.141	-0.99	-1.60	0.13
HA301	-0.28	1.37	-1.35	-0.90	-0.60	-0.87	-1.150	-0.25
JE1	-1.05	1.42	-1.11	-0.48	-1.02	-0.97	-1.38	0.49
FL5	-0.92	1.78	-2.08	-0.78	-1.00	-1.135	-0.75	0.29
MU102	-1.15	0.97	-1.33	-0.25	-1.69	-1.78	-1.15	0.25

Table 6-6: Pooled Tetrachoric Correlation Matrix Derived for Cranial Traits

SN	SF	MZF	MIF	AO	FSS	LO	DH	MMF	MB
1.00000									
-0.89475	1.00000								
0.05662	-0.02956	1.00000							
-0.04819	0.02078	-0.03707	1.00000						
-0.13010	0.13721	-0.07930	0.12874	1.00000					
-0.04411	0.17224	0.06528	0.16357	-0.22270	1.00000				
-0.17910	0.11586	0.14939	-0.13345	0.47008	0.05195	1.00000			
-0.08827	0.07654	-0.03051	0.20703	0.05130	0.25264	0.04659	1.00000		
0.06780	0.01298	0.10332	0.06787	0.11498	0.13466	0.10016	0.21081	1.00000	
0.02881	-0.07751	0.19121	-0.04128	-0.06064	-0.11281	0.11785	-0.12655	0.16504	1.00000

Table 6-7: Pooled Tetrachoric Correlation Matrix Derived for Dental Traits

IGI2	MUM2	CUM1	HUM3	LCLP2	PRLP1	GPLM2	PLM3
1.00000							
-0.06435	1.00000						
0.05315	-0.13461	1.00000					
-0.11507	-0.05555	0.11111	1.00000				
0.10521	-0.11174	0.17459	0.16636	1.00000			
0.18651	-0.25025	0.16073	0.11104	0.25552	1.00000		
0.11477	-0.25702	0.29969	0.23220	0.10055	0.31169	1.00000	
0.02829	-0.07847	-0.26703	0.06516	0.05715	-0.21379	0.11338	1.00000

Table 6-8: Distance Matrix Calculated with Cranial Traits

AN19	BY13	HA301	JE1	FL5	MU102
0					
0.051	0				
0.253	0.227	0			
0.043	0.110	0.254	0		
0.108	0.126	0.274	0.143	0	
0.271	0.268	0.620	0.180	0.314	0

Table 6-9: Distance Matrix Calculated with Dental Traits

AN19	BY13	HA301	JE1	FL5	MU102
0					
0.029	0				
0.221	0.178	0			
0.210	0.116	0.275	0		
0.456	0.345	0.220	0.368	0	
0.263	0.254	0.419	0.261	0.432	0

Table 6-10: Distance Matrix Calculated with All Traits

AN19	BY13	HA301	JE1	FL5	MU102
0					
0.043	0				
0.269	0.258	0			
0.182	0.158	0.297	0		
0.385	0.413	0.360	0.406	0	
0.323	0.274	0.493	0.202	0.376	0

This finding is not surprising given the geographic distance between the sites.

Interestingly, the Barnett Phase Little Egypt (MU102) and King (FL5) sites appear to be biologically separated. Griffin's (1993) biological distance study using Smith's MMD had similar results for King and Little Egypt. Analyses of the dental and cranial nometric traits did demonstrate some inconstancies. The David Davis site is slightly more similar to the other East Tennessee sites for the dental traits than the cranial traits demonstrate. For the cranial biological distance analysis, Little Egypt represents the most divergent population, whereas dental biological distance analysis shows the King site sample marks the greatest biological distance among the groups. A number of factors may have contributed to these inconsistencies. Crania for both the David Davis site and the Little Egypt site were highly fragmentary and thus the analysis based on cranial traits may have been more affected by missing data. Furthermore, other researchers have found slight inconsistencies between cranial and dental nonmetric traits that may simply represent differences in etiological background (Griffin 1993). Although there is a slight difference between the dental and cranial distance matrices, when the two-way Mantel test was performed for the two biological distance matrices they were significantly correlated at the 0.1 level ($r^2 = 0.189$, p-value=0.090)

A Mantel matrix comparison test was performed to examine the relationship between biological distance and geography. The geographic distances used for comparison were those previously discussed and shown in Table 5-4. Straight-line distances were not statistically correlated with either the cranial, dental, and combined traits biological distance matrix (Table 6-11). These results indicate that biological

Table 6-11: Mantel Matrix Comparisons

Matrix Comparison	*R*	R^2	*p*-value
Cranial Distance * Geographic Distance	0.090	0.008	0.621
Dental Distance * Geographic Distance	0.100	0.010	0.333
All Traits Distance * Geographic Distance	0.134	0.018	0.319
Dental Distance * Cranial Distance	0.435	0.189	0.090

distances measured between the sites do not conform to the expected isolation-by-distance model in which biological distance increases with geographic distances.

Plots of the first two principal coordinates from the biological distance matrices are presented in Figure 6-1 for dental traits and Figure 6-2 for cranial traits. For cranial traits, the Fains Island, Cox, and Ledford Island samples cluster together on the first two eigenvectors. The King and David Davis samples diverge from this cluster on the second eigenvector and the Little Egypt sample diverges from all of the other sites. Sample size and biases resulting from the excavations may have skewed the results for the Little Egypt sample. The majority of the burials from Little Egypt were associated with two household clusters. If Sullivan's (1986) and Hally's (2008) assessment is correct and these burial clusters represent kin groups then it is possible that the trait frequencies represented in the Little Egypt sample do not represent the complete trait variation for the entire population. The principal coordinate plot for the cranial traits demonstrates a closely similar pattern. Once again, Fains Island, Ledford Island and Cox cluster closely together. With cranial traits, however, Fains Island and Cox cluster more closely than Ledford Island on the second axis. Little Egypt, King, and David Davis diverge sharply from each other and from the Fains, Ledford, and Cox cluster.

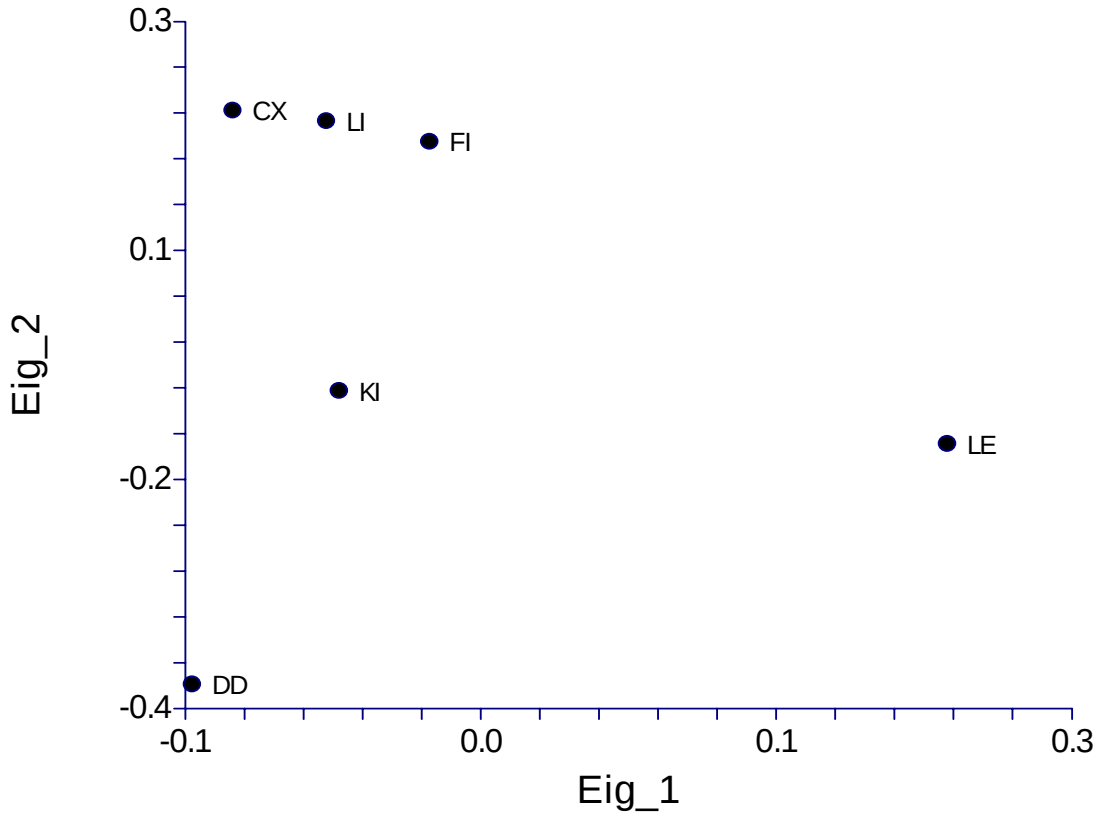


Figure 6-1: Principal Coordinate Plot of First Two Eigenvectors Derived from Cranial Traits (CX=Cox, LI =Ledford Island, DD=David Davis FI=Fains Island, KI=King. LE=Little Egypt)

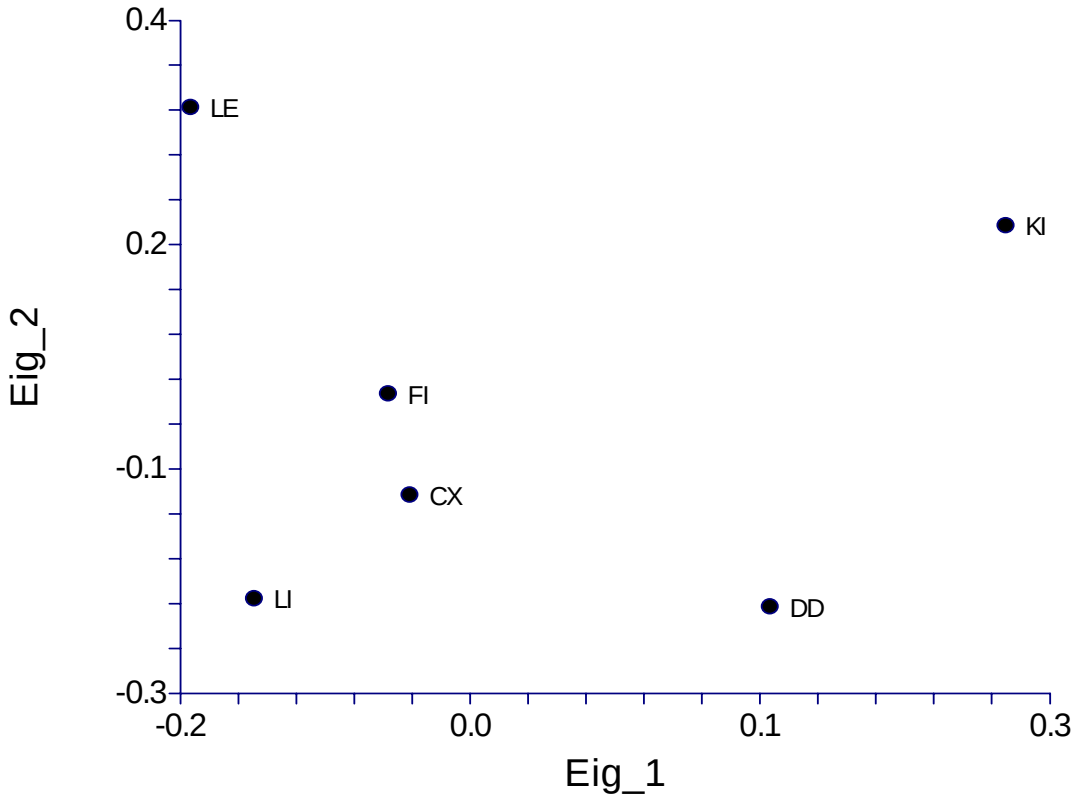


Figure 6-2: Principal Coordinate Plot of First Two Eigenvectors Derived from Dental Traits.

F_{ST} and Modified Relethford-Blangero Analysis

C and R matrices were constructed separately for the dental and cranial traits. The resulting matrices can be seen in Appendix B. Using the C matrix as discussed in Chapter 4, the F_{ST} calculated for the distance matrices equals .052 for cranial traits and .053 dental traits, with the assumption of equal effective population size and full heritability. This measure of regional genetic differentiation is high when compared to other Southeastern and Midsouth Amerindian populations. Jorde (1980) notes that caution must be exercised when comparing F_{ST} values among populations because several issues including differences in population sizes, and differences in mate exchange networks can affect these values. The F_{ST} values shown in Table 6-12 are derived from prehistoric archaeological samples from similar environments, and for some of the samples similar cultural settings, that are useful for a broad generalized comparison. For instance, Mississippian sites from the Georgia Coast that have a comparably lower F_{ST} value (.008) indicate very little regional differentiation among populations (Stojanowski 2004). The minimum F_{ST} value obtained for both the cranial and dental nonmetric traits from the study sample does suggest that the groups within the proposed Coosa chiefdom do not represent a single unified biological group and instead represent a relatively highly differentiated series of groups.

Using the equation $F_{ST} \approx 1/(4N_em + 1)$ discussed in Chapter 4 to estimate the number of average migrants per generation across samples would be approximately 5 migrants per generation. As noted previously this should be viewed cautiously given the assumptions associated with the calculation.

Table 6-12: Comparative F_{ST} Estimates for Midsouth and Southern Amerindian Populations

Location/Period	F_{ST}	Approximate Maximum Distance	Reference
Florida Late Prehistoric	0.008	100	Stojanowski 2005
Illinois Woodland	0.004	210	Steadman 1997,2004
Illinois Mississippian	0.01	110	Steadman 1997,2004
Kentucky Green River Late Archaic	0.02	150	Herrmann 2002
Ohio Late Archaic	0.04	150	Tatarek and Sciulli 2000
Ohio Late Prehistoric	0.07	300	Tatarek and Sciulli 2000
Current Study	0.05	250	

A modified Relethford-Blangero analysis was performed on the cranial and dental traits and the results can be found in Tables 6-13 and 6-14. The covariance matrices used to perform the Relethford-Blangero analysis can be found in Appendix B. Negative residuals indicate below average extra-local gene flow and positive values indicate greater than average extra-local gene flow. The results indicate that the residuals for the site are quite low and that all of the East Tennessee sites have negative residuals indicating less than average expected gene flow. Both Georgia samples are positive suggesting slightly greater than expected gene flow.

Biological Distance Divided by Sex

The examination of the biological distance structures between sexes can yield information regarding intra-site variation that can be used to infer postmarital residenece patterns. For this analysis, tetrochronic correlations and threshold values were calculated for males and females separately within each site. Similar to the undivided analysis, all traits with extreme threshold values were removed from the analysis. Six dental and cranial traits were retained for the analysis: supraorbital notch, apical ossicle, multiple zygomatic foramen, mylohyoid bridge, grove pattern UM2, and metaconual cusp UM2. The results of the biological distances matrices for the divided sexes can be seen in Table 6-15. Once again the distance values were divided by the number of traits. The distribution of male and female in the principle coordinate plot do not show a distinct pattern making interpretation difficult. Nonetheless, Cox females, Fains Island males, Ledford Island males and Ledford Island females all tend to cluster

Table 6-13: Modified Relethford-Blangero analysis of the Cranial Nonmetric Traits

Site	r_{ii}	$\overline{V}_{GW}$	$E\overline{V}_{Gi}$	$(\overline{V}_{Gw} - E\overline{V}_{Gi})$
Cox	0.032	0.177	0.180	-0.003
Ledford Island	0.016	0.186	0.193	-0.007
David Davis	0.041	0.166	0.168	-0.002
Fains Island	0.035	0.169	0.172	-0.003
King	0.073	0.250	0.244	0.006
Little Egypt	0.061	0.148	0.146	0.002

F_{ST} =.05
Average V_{gw} =0.183
r_{ii} =Phenotypic distance from the centroid
$\overline{V}_{GW}$ =Observed variance
$E\overline{V}_{Gi}$ =Expected variance
$(\overline{V}_{Gw} - E\overline{V}_{Gi})$ = Residuals

Table 6-14: Modified Relethford-Blangero analysis of the Dental Nonmetric Traits

Site	r_{ii}	$\overline{V}_{GW}$	$E\overline{V}_{Gi}$	$(\overline{V}_{Gw} - E\overline{V}_{Gi})$
Cox	0.040	0.144	0.146	-0.002
Ledford Island	0.019	0.137	0.142	-0.004
David Davis	0.050	0.150	0.149	0.000
Fains Island	0.043	0.130	0.131	-0.001
King	0.090	0.291	0.279	0.012
Little Egypt	0.075	0.103	0.100	0.003

F_{ST} =.05
Average V_{gw}= 0.159

Table 6-15: Biological distance matrix sites divided by sex. Sample sizes in parenthesis

AN19M (52)	AN19F (44)	BY13M (91)	BY13F (42)	HA302M (16)	HA302F (18)	JE1M (71)	JE1F (67)	FL5M (33)	FL5F (20)
0									
0.17	0								
0.18	0.10	0							
0.17	0.15	0.09	0						
0.49	0.20	0.30	0.47	0					
0.73	0.53	0.61	0.27	0.61	0				
0.12	0.05	0.13	0.21	0.32	0.65	0			
0.17	0.21	0.27	0.27	0.46	0.70	0.13	0		
0.61	0.51	0.60	0.48	0.28	1.53	0.61	0.48	0	
0.23	0.17	0.28	0.15	0.31	0.32	0.23	0.34	0.71	0

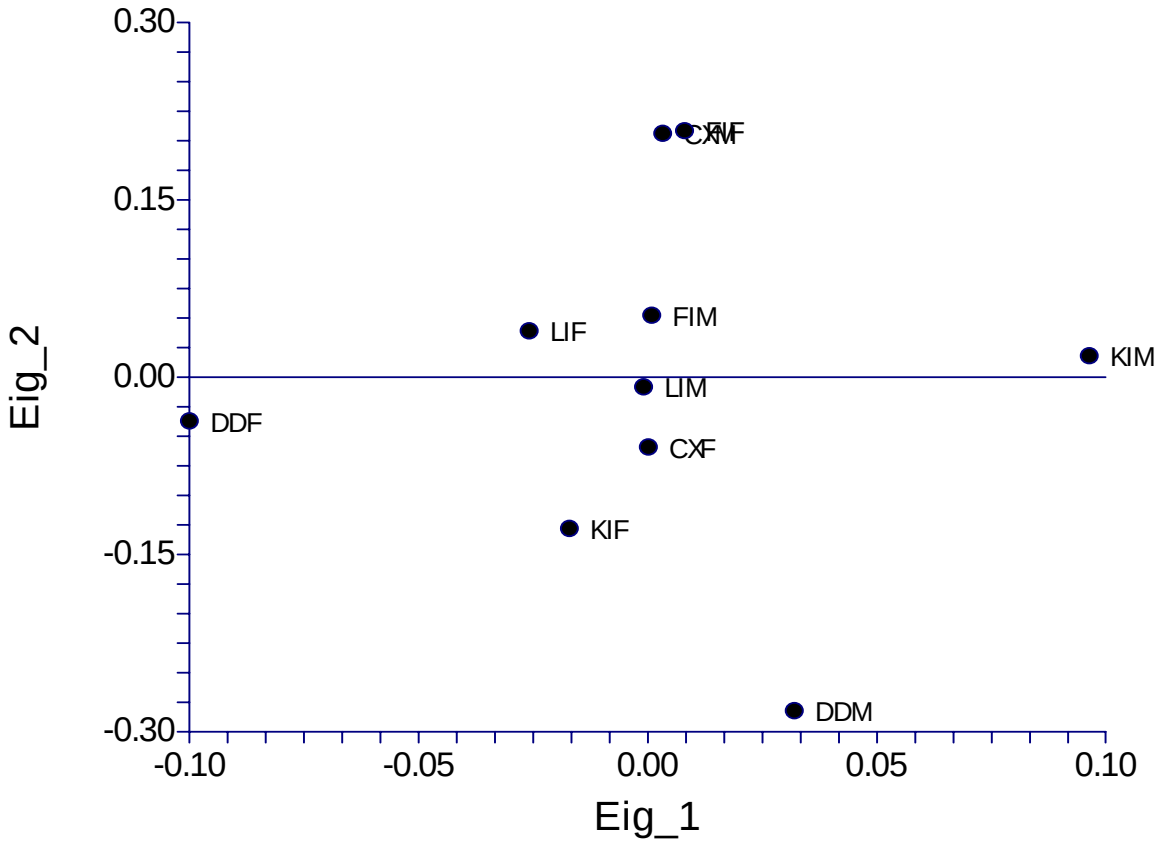


Figure 6-3: Principal Coordinate Plot of First Two Eigenvectors Derived from Cranial Traits

together. Interestingly, the Fains Island site females and the Cox site males cluster closely together on both coordinates. The David Davis and King samples diverge the greatest both between sexes and between the other groups. This pattern, especially for the David Davis site, may be a reflection of small sample sizes and sampling error. It does appear that the King females cluster closer to the Dallas/Mouse Creek cluster than the King site males. It should be noted that any interpretations of biological patterns and postmarital residence patterns using biological distance matrices is tenuous at best. A C-matrix and R-matrix was also obtained from divided sex distance matrix and can be seen in Appendix B. The F_{ST} value was slightly higher for the divided sex (.08) than the pooled F_{ST} sexes value.

Discussion

The results of the comparative analyses of biological characteristics of the population samples used in this study suggest several interpretations for interactions among the represented communities. Although the use of more formalized "model bound" techniques in this study provides advancement in the estimation of population structures, the quantity and quality of the examined archaeological samples limits some of the interpretation. Missing data could have significantly influenced biological distance measures especially for Little Egypt and David Davis samples. These samples contain a great deal of missing data and represent the two most divergent sites within the cranial traits analysis. Due to the limited scale of excavations at the Little Egypt site, the sample may represent a smaller amount of the genetic variation than is actually present at the site. Results from the Relethford-Blangero analysis however. suggest otherwise. Missing data in the Little Egypt sample may explain why the two Barnett Phase sites,

Little Egypt and King, diverged so greatly from each other. Another explanation for differences between the Little Egypt and King samples may relate to Hally's (2008) argument that the King site represents a temporally shorter and later occupation than that of the Little Egypt site. A further explanation is discussed below. The sample from the David Davis site is tentatively referred to as a Dallas Phase site (Alexander and Trudeau 2007), but without more information regarding the cultural characteristics at this site, it is difficult to determine if the results of the biological analyses can be simply explained by skewed data alone or if some other cultural phenomena is also at play.

The biological analyses do provide some insight regarding the nature of interaction between eastern Tennessee and northern Georgia groups. The Mouse Creek Phase Ledford Island site and the Dallas Phase Cox and Fains Island sites share a close genetic affinity as represented by the biological distance analysis and corresponding PCO scatterplot. These findings suggest a high amount of gene flow between these communities. The results also conform to Boyd and Boyd's (1991) and Weston's (2005) biological distance findings and archaeological arguments that the Mouse Creek Phase represents an in-situ development from earlier Dallas populations and is not the result of an influx of new groups into the area.

Nonetheless, when an examination is made of the full range of sites used in the analysis, Mantel tests between geographic distance and biological distances do not conform to the expected isolation by distance. The phenotypic difference between the eastern Tennessee and northern Georgia groups perhaps represent a cultural and ethnic boundary. Such boundaries can give rise to and/or reinforce group membership, but have variable importance that may change through time (Eriksen 1993). Furthermore, cultural traits and social organization may change

without changing a group's social boundary (Eriksen 1993). This appears to be the case for the Ledford Island, Mouse Creek community and the Dallas Phase Fains Island and Cox communities. The phenotypic similarities indicate that although differences are evident in the material culture and mortuary ritual as outlined in the preceding chapters, these differences were not coupled with a decrease in interaction or changes within the mate exchange network. These social boundaries may have affected gene flow between the Tennessee communities and those of the Barnett Phase King and Little Egypt groups. Biological distance analysis and the PCO plots suggest that King and Little Egypt were not only biologically distinct from one another, but also biologically distinct from the Mouse Creek/Dallas cluster. The biological distance analysis supports archaeological evidence, specifically differences in the material culture, that the Barnett Phase and Dallas/Mouse Creek groups were culturally distinct. This distinction, in part, may also reflect very little social integration between these communities insomuch as this would be reflected in mate exchange and thus phenotypic similarities.

The F_{ST} values also suggest a higher among-group genetic variability, which would indicate limited gene flow throughout the region. Results of the Relethford-Blangero analysis shows that the majority of the residual values (e.g., Ledford Island, David Davis, Fains Island, and Cox) are near zero or negative, indicating very little extra-local gene flow. The King site sample possesses a larger, positive residual which suggests higher amounts of extra-local gene flow. This finding is interesting given Hally's argument that the late fifteenth- and early sixteenth-century occupation of the Coosa Valley has no archaeological antecedents. Hally (2008:538-539) suggests that the area may have been settled by "immigrants" of segmented groups from the Consasauga and Coosawattee rivers or from northeastern Alabama who

previously occupied the Middle Coosa and Tennessee Rivers. He contends that ceramic similarities support this possibility. If the King site indeed represents a coalescent group of "immigrants," then this scenario may explain the higher levels of heterogeneity as compared with the other sites used in the analysis. Hally also suggests that these immigrants may represent groups from East Tennessee. Results from the biological distance analysis suggest otherwise.

The results of the Relethford-Blangero analysis also provide insights to the Fains Island mortuary program. The results of the Fains Island Relethford-Blangero analysis are comparable to the samples derived from Cox and Ledford Island, which were recovered from excavations of village and domestic deposits as well as those from mounds and public spaces. These similarities appear to support the interpretation that mound burial at Fains Island was open to the entire community and not just to a select kin group.

As stated previously, changes within the Mississippian world were starting to take place both externally (e.g., the collapse of large polities, the population abandonment of certain regions) and internally (e.g., cessation of mound building, a decrease in hierarchical organization, and larger villages at some localities) even prior to European contact. These sociopolitical changes possibly influenced the level of social integration, the construction of disparate cultural identities, the formation of different ethnic groups, and the increased maintenance or new construction of social boundaries. Such changes can lead to an influx of new individuals via migration or a broadening of social boundaries that biologically would result in the increase of phenotypic heterogeneity. Inversely, when change may be at its strongest and boundaries come under pressure, the most conspicuous forms of boundary maintenance may predominate: a "process that reinforces group solidarity and assures continuity with the past

during time of flux"(Penner 2004:254). If boundary maintenance includes cultural rules regarding mate exchange networks, then the biological expectation would be homogeneity between groups within these social boundaries and increased heterogeneity between groups outside of the maintained boundaries. Such a situation may be the case between the eastern Tennessee and northern Georgia groups. Of course, biological evidence does not provide or refute evidence of political integration among these groups; for that, we must turn to archaeological investigations. Nonetheless, the results of the biological analyses do suggest that if there was political interaction or integration between these groups, such political involvement was not congruent with social integration for individuals at the community level. The results of this study offer a snapshot in time, so without further work, it is impossible to determine if the observed boundaries are a result of greater regional wide changes or if the they mark a continuation of long-standing social boundaries.

Chapter VII: Summary and Conclusions

Research regarding the interactions of Late Mississippian groups in East Tennessee and North Georgia has often been framed in terms of political economy. Specifically, this discussion has centered on the interpretation of the Coosa paramountcy described by sixteenth-century Spanish accounts (Hally and Langford 1988; Hally et al. 1990; Hudson et al. 1985, 1987). Despite the considerable attention devoted to development of these political models, little attention has been paid to what effect long distance interactions among the involved communities may have had on the construction of cultural identity at the community level. The expectation is that the political integration of communities by a chiefly paramountcy would lead to increased social integration among these groups. Mate exchange networks also could have been a means of forming political alliances. Such interactions likely would lead to a unifying effect of the genetic structures of these communities. If these processes were in effect, the expectations are for low estimates of genetic divergence between the community samples and a genetic structure that suggests isolation by distance, thus suggesting networks of interregional mate exchange.

This study couples biological data with aspects of material culture and mortuary ritual for several sites within the proposed Coosa chiefdom in order to explore how cultural identities were actively constructed and maintained within this region. Material culture, as reflected by pottery technology and styles, suggests that Mouse Creek and Dallas communities were similar. However, these similarities were coupled with profound differences between the communities' mortuary programs. Likewise, when Barnett Phase communities are added to the comparison

differences are apparent not only in the material culture, but also in the mortuary program as represented by the King site. These differences may represent differences in the construction of cultural identity or different ethnic groups entirely. These differences do not imply that these groups had no social interactions. Shared material culture such as the widespread occurrence of shell gorgets, especially the Citico style gorget, and the inclusion of Dallas-like pottery among some Barnett Phase burials attest to regional interaction in the form of long distance trade networks. In fact, this interaction may have played some part in the formation of disparate cultural identities since the formation of cultural identities or ethnicities is "the product of contact, not isolation, and, as such, is not a collection of static cultural traits but rather a continually mediated set of relationships" (Penner 1997:261). The question that remained unanswered and that this study addressed is whether this interaction was associated with social integration, and how this interaction was reflected at the community level and within mate exchange networks.

The biological distance analysis for the sample communities was conducted within a "model-bound" population perspective (Relethford and Blangero 1990; Relethford and Lees 1982). Both cranial and nonmetric traits were used and, albeit some slight differences, produced complimentary measures of biological distances. The differences observed may be the result of the cranial traits being more susceptible to missing data. Results from the biological distance analysis suggest that the Mouse Creek and Dallas Phase sites (as represented by the samples from Leford Island, Fains Island, and Cox sites) are biologically similar, suggesting population gene flow between these groups. In all of the population structure analyses, the population samples for Ledford Island and Cox were consistently the most phenotypically similar. This

finding suggests that despite differences between the mortuary programs at these two sites that would otherwise indicate differences in cultural identities, these differences did not limit mate exchange. These findings also indicate that differences in mortuary ritual were not the result of an in-migration of an outside group.

The biological distance results for the David Davis site sample are more difficult to interpret. Given that the other Dallas Phase site samples are biologically similar to the Mouse Creek Phase Ledford Island site, and given the close geographic proximity of Ledford Island and the David Davis site, one would expect these two samples to be phenotypically similar. While analysis of the dental traits did result in a closer biological distance between the David Davis sample and the other eastern Tennessee site samples, the results are not consistent with the expectations of a general isolation by distance model. These results may have been affected by highly fragmentary nature of the dataset that contributed to missing data. Further research on the material culture from the David Davis site may shed more light on this pattern when information can be compared with that from better-known Dallas sites.

Based on the nonmetric cranial and dental discrete traits, the Barnett Phase sites are biologically distinct from the Dallas and Mouse Creek Phase sites and also distinct from one another. At least for the Barnett, Dallas and Mouse Creek Phase sites in the study sample, there is some evidence that the population structure mimics subgroup identity as reflected in mortuary ritual and material remains (e.g., pottery). Given the biological differentiation between the Dallas and Mouse Creek sites and those of the Barnett Phase, it is possible that a cultural boundary existed that limited gene flow between these populations. Biological differences

between the samples from the Little Egypt and King sites may represent the population histories of these two communities (Hally 2008).

F_{ST} values and the results of the Relethford-Blangero analysis suggest that all the populations represented by the study samples were relatively distinct and not subject to a great amount of extra-local gene flow. The one exception to this pattern is the King site. This exception may reflect Hally's (2008) suggestion that the Coosa River valley was occupied by coalescent groups.

Directions for Future Research

In recent decades, there has been growing sophistication in the extraction of DNA for analyses to estimate genetic relatedness among archaeological samples. Isotopic analyses such as strontium isotope ratios also can be used in order to identify migrant individuals from different "geological" residences (c.f., Bentley 2006). Since fewer a priori assumptions are involved with DNA or isotopic analysis, these techniques may appear to be more attractive than traditional biological distance studies using polygenic traits. A problem is that these analyses require destructive techniques. With the advent of the Native American Graves Reparation Act (NAGPRA) and growing communication and collaboration with living Native American tribes, such destructive techniques may not be an option for some bioarchaeologists working in North America, especially when such destructive techniques are against the expressed wishes of tribal representatives. The research presented here demonstrates the utility of classic polygenic biological distance studies using formal model bound techniques to answer questions relevant to current archaeological discourse, without resorting to destructive techniques. DNA and isotopic analysis also can be costly. Another advantage of biological distance studies is the ability to

incorporate a larger sample size,such as the one used for this study, without incurring large financial costs.

By demonstrating the value of biological distance analysis and bioarchaeological data in general within the discussion about the Coosa paramount chiefdom , this study marks just the beginning of research that can be done regarding the regional biological interactions within the proposed Coosa province. More insights on the population structure documented in this study can be gained byincorporating samples from additional Mouse Creek, Dallas, and Barnett Phase sites used in the Coosa reconstruction into the biological analyses. The incorporation of many of these sites is unfortunately hampered by small population sizes and lack of good temporal control. Such research also could be better served by adding other spheres of regional interaction within the analysis. The incorporation of western North Carolina site samples is one example.

This study of the Coosa province also represents just one period in time. Adding samples from earlier temporal components would allow an appreciation of how cultural boundaries may have transformed through time. The incorporation of later sites also would be ideal, however, since most of these skeletal remains from these sites have been reburied that is no longer an option. Further attention also needs to be paid to the possible presence of subpopulations within sites. Large excavated sites such as the Ledford Island and King sites, both of which have fairly demarcated cemeteries associated with residences, offer the intriguing possibility of examining kinship structures within sites (c.f., Stojanowski and Schillaci 2006). Usher's (2005) work on the genetic structure of cemeteries using the clustering program SatScan (www.satscan.org) offers intriguing new possibilities for examining this issue. While Usher's study specifically examined

Y chromosome and Mitiochronidrial DNA, it is possible that this technique could be used for nonmetric traits with some adjustments.

As archaeologists attempt to reconstruct political systems in the past, we must not forget the individuals that created and were affected by these systems. The integration of mortuary ritual, ethnohistorical data, material culture, and biological data has the promise of offering archaeologists a more nuanced picture of how individual community members actively negotiated such political systems. In this respect, biological distance analysis is a vital tool in elucidating social integration and interaction among communities.

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Appendix A: Trait Frequencies

Table A1: Ledford Island Cranial Nonmetric Trait Frequencies

Site	*N*	*Trait Code*	*Trait*	*Unobservable*	*Present*	*Absent*	*Frequency*
Ledford Island	**281**	MS	Metopic Suture	132	0	149	0.00
		SN	Supraorbital Notch	126	95	60	0.61
		SF	Suprorbital Foramen	125	80	76	0.51
		MSF	Multiple Suprorbital Foramen	139	14	128	0.10
		IS	Infraorbital Suture	208	15	58	0.21
		MIF	Multiple Infraorbital Foramen	211	7	63	0.10
		MZF	Multiple Zygomatic Facial Foramen	161	41	79	0.34
		BB	Bragmatic Bone	181	3	97	0.03
		AO	Appical Ossicle	186	30	65	0.32
		IB	Inca Bone	182	4	95	0.04
		SSF	Sinus Flexure	171	16	94	0.15
		AB	Astrionic Bone	197	15	69	0.18
		PN	Parietal Notch Bone	210	5	66	0.07
		LO	Lambdoidal Ossicle	189	53	39	0.58
		MO	Mastooccipital Ossicle	209	10	62	0.14
		PC	Post-condylar Canal	220	42	19	0.69
		DH	Divided Hypoglossal Canal	198	15	68	0.18
		AE	Auditory Exostosis	77	19	185	0.09
		MMF	Multiple Mastoid Foramen	160	40	81	0.33
		AP	Assessory Lesser Palatine Foramen	223	16	42	0.28
		MF	Multiple Mental Foramen	103	1	177	0.01
		MB	Mylohyoid Bridge	125	15	141	0.10

A2: Ledford Island Dental Nonmetric Trait Frequencies

Site	*N*	*Trait Code*	*Trait*	*Unobservable*	*Present*	*Absent*	*Frequency*
Ledford Island	**281**	SUI1	Shoveling UI1	166	103	12	0.90
		SUI2	Shoveling UI2	167	106	8	0.93
		DSUI1	Double Shoveling UI1	161	112	8	0.93
		DSUI2	Double Shoveling UI2	167	100	14	0.88
		IGI2	Interruption groove UI2	167	35	79	0.31
		MUM1	Metaconcule UM1	142	3	136	0.02
		MUM2	Metaconcule UM2	143	9	129	0.07
		MUM3	Metaconcule UM3	195	9	77	0.10
		CUM1	Carabelli's cusp UM1	138	13	130	0.09
		CUM2	Carabelli's cusp UM2	141	4	136	0.03
		CUM3	Carabelli's cusp UM3	194	3	84	0.03
		PUM1	Parastyle UM1	138	0	143	0.00
		PUM2	Parastyle UM2	136	3	142	0.02
		PUM3	Parastyle UM3	196	2	83	0.02
		HUM2	Hypocone UM2	143	95	43	0.69
		HUM3	Hypocone UM3	187	35	59	0.37
		PRLP1	Premolar Root LP1	224	9	48	0.16
		PRLP2	Premolar Root LP2	230	15	36	0.29
		LCLP1	Lingual Cusp LP1	150	20	111	0.15
		LCLP2	Lingual Cusp LP2	147	17	117	0.13
		PSUI2	Peg-shaped incisors UI2	193	2	86	0.02
		PSUM3	Peg-shaped molars UM3	180	2	99	0.02
		GPlM1	Groove pattern UM1	190	13	78	0.14
		GPLM2	Groove pattern UM2	196	38	47	0.45
		PLM1	Protostylid UM1	169	0	112	0.00
		PLM2	Protostylid UM2	164	0	117	0.00
		PLM3	Protostylid UM3	190	4	87	0.04

Table A3: King Cranial Nonmetric Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
King	**130**	MS	66	1	63	0.02
		SN	74	28	28	0.50
		SF	75	35	20	0.64
		MSF	77	10	43	0.19
		IS	108	1	21	0.05
		MIF	112	0	18	0.00
		MZF	89	6	35	0.15
		BB	71	2	57	0.03
		AO	87	14	29	0.33
		IB	89	1	40	0.02
		SSF	87	7	36	0.16
		AB	97	5	28	0.15
		PN	103	4	23	0.15
		LO	86	27	17	0.61
		MO	85	7	38	0.16
		PC	106	11	13	0.46
		DH	97	5	28	0.15
		AE	58	12	60	0.17
		MMF	74	8	48	0.14
		AP	109	4	17	0.19
		MF	64	2	64	0.03
		MB	80	2	48	0.04

Table A4: King Dental Nonmetric Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
King	**130**	SUI1	79	23	28	0.45
		SUI2	84	43	3	0.93
		DSUI1	76	52	2	0.96
		DSUI2	84	44	2	0.96
		IGI2	84	8	38	0.17
		MUM1	66	3	61	0.05
		MUM2	76	1	53	0.02
		MUM3	87	4	39	0.09
		CUM1	66	11	53	0.17
		CUM2	75	5	50	0.09
		CUM3	87	1	42	0.02
		PUM1	69	5	56	0.08
		PUM2	73	2	55	0.04
		PUM3	85	7	38	0.16
		HUM2	76	40	14	0.74
		HUM3	84	10	36	0.22
		PRLP1	90	5	35	0.13
		PRLP2	97	4	29	0.12
		LCLP1	67	4	59	0.06
		LCLP2	72	9	49	0.16
		PSUI2	84	0	46	0.00
		PSUM3	81	0	49	0.00
		GPLM1	95	16	19	0.46
		GPLM2	91	24	15	0.62
		PLM1	81	1	48	0.02
		PLM2	82	2	46	0.04
		PLM3	99	7	24	0.23

Table A5: Little Egypt Nonmetric Cranial Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Little Egypt	**26**	MS	9	0	17	0.00
		SN	11	7	8	0.47
		SF	11	8	7	0.53
		MSF	11	3	12	0.20
		IS	18	1	7	0.13
		MIF	18	0	8	0.00
		MZF	18	14	4	0.78
		BB	14	0	12	0.00
		AO	22	0	4	0.00
		IB	22	0	4	0.00
		SF	18	1	7	0.13
		AB	22	2	2	0.50
		PN	24	0	2	0.00
		LO	17	7	2	0.78
		MO	17	0	9	0.00
		PC	20	3	3	0.50
		DH	14	2	10	0.17
		AE	15	1	10	0.09
		MMF	15	1	10	0.09
		AP	22	0	4	0.00
		MF	12	0	14	0.00
		MB	16	1	9	0.10

Table A6: Little Egypt Nonmetric Dental Traits Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Little Egypt	**26**	SUI1	18	5	3	0.63
		SUI2	18	6	2	0.75
		DSUI1	20	6	0	1.00
		DSUI2	15	8	3	0.73
		IGI2	18	2	6	0.25
		MUM1	16	0	10	0.00
		MUM2	15	1	10	0.09
		MUM3	16	3	7	0.30
		CUM1	16	1	9	0.10
		CUM2	15	0	11	0.00
		CUM3	17	0	9	0.00
		PUM1	16	0	10	0.00
		PUM2	15	0	11	0.00
		PUM3	15	1	10	0.09
		HUM2	14	9	3	0.75
		HUM3	16	4	6	0.40
		PRLP1	13	0	13	0.00
		PRLP1	17	0	9	0.00
		LCLP1	11	3	12	0.20
		LCLP2	16	0	10	0.00
		PSUI2	18	0	8	0.00
		PSUM3	17	0	9	0.00
		GPLM1	18	0	8	0.00
		GPLM2	17	6	3	0.67
		PLM1	17	0	9	0.00
		PLM2	13	0	13	0.00
		PLM3	23	0	3	0.00

Table A7: Cox Nonmetric Cranial Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Cox	**163**	MS	48	0	116	0.00
		SN	54	53	57	0.48
		SF	54	67	43	0.61
		MSF	59	20	85	0.19
		IS	96	22	45	0.33
		MIF	100	4	59	0.06
		MZF	72	25	65	0.28
		BB	94	2	67	0.03
		AO	87	22	54	0.29
		IB	71	2	90	0.02
		SF	61	16	86	0.16
		AB	118	10	35	0.22
		PN	123	4	36	0.10
		LO	78	60	25	0.71
		MO	104	15	44	0.25
		PC	104	37	22	0.63
		DH	80	11	72	0.13
		AE	31	10	122	0.08
		MMF	72	32	59	0.35
		AP	112	15	36	0.29
		MF	37	4	122	0.03
		MB	37	17	109	0.13

Table A8: Cox Nonmetric Dental Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Cox	**165**	SUI1	97	52	14	0.79
		SUI2	91	66	6	0.92
		DSUI1	89	67	7	0.91
		DSUI2	94	52	17	0.75
		IGI2	91	23	49	0.32
		MUM1	71	4	88	0.04
		MUM2	70	5	88	0.05
		MUM3	93	10	60	0.14
		CUM1	65	2	96	0.02
		CUM2	63	2	98	0.02
		CUM3	91	3	69	0.04
		PUM1	66	3	94	0.03
		PUM2	61	4	98	0.04
		PUM3	88	6	69	0.08
		HUM2	64	75	24	0.76
		HUM3	88	29	46	0.39
		PRLP1	122	6	35	0.15
		PRLP1	122	6	35	0.15
		LCLP1	129	5	29	0.15
		LCLP2	70	14	79	0.15
		PSUI2	89		74	0.00
		PSUM3	68	3	92	0.03
		GPLM1	94	6	63	0.09
		GPLM2	94	33	36	0.48
		PLM1	73	0	90	0.00
		PLM2	71	0	92	0.00
		PLM3	95	1	67	0.01

Table A9: David Davis Nonmetric Cranial Traits Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
David Davis	**99**	MS	70	0	29	0.00
		SN	62	21	16	0.57
		SF	67	15	17	0.47
		MSF	75	3	21	0.13
		IS	89	3	7	0.30
		MIF	91	0	8	0.00
		MZF	73	6	20	0.23
		BB	91	0	8	0.00
		AO	91	5	3	0.63
		IB	92	0	7	0.00
		SF	77	3	19	0.14
		AB	93	1	5	0.17
		PN	97	0	2	0.00
		LO	93	4	2	0.67
		MO	93	3	3	0.50
		PC	92	7	0	1.00
		DH	77	3	19	0.14
		AE	62	5	32	0.14
		MMF	86	2	11	0.15
		AP	96	0	3	0.00
		MF	67	0	32	0.00
		MB	67	7	25	0.22

Table A10: David Davis Nonmetric Dental Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
David Davis	**99**	SUI1	55	38	6	0.86
		SUI2	52	44	3	0.94
		DSUI1	51	43	5	0.90
		DSUI2	54	39	6	0.87
		IGI2	52	18	29	0.38
		MUM1	39	4	56	0.07
		MUM2	42	5	52	0.09
		MUM3	45	7	47	0.13
		CUM1	41	5	53	0.09
		CUM2	40	0	59	0.00
		CUM3	43	0	56	0.00
		PUM1	40	0	59	0.00
		PUM2	40	2	57	0.03
		PUM3	46	1	52	0.02
		HUM2	40	41	18	0.69
		HUM3	43	46	10	0.82
		PRLP1	35	9	55	0.14
		PRLP2	48	8	43	0.16
		LCLP1	42	11	42	0.21
		LCLP2	48	8	43	0.16
		PSUI2	52	3	44	0.06
		PSUM3	50	5	44	0.10
		GPLM1	57	6	36	0.14
		GPLM2	59	16	24	0.40
		PLM1	46	1	52	0.02
		PLM2	46	1	52	0.02
		PLM3	50	6	43	0.12

Table A11: Fains Islan Nonmetric Cranial Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Fains Island	**224**	MS	125	0	99	0.00
		SN	126	56	42	0.57
		SF	126	56	42	0.57
		MSF	129	18	77	0.19
		IS	158	5	61	0.08
		MIF	157	6	61	0.09
		MZF	137	23	64	0.26
		BB	152	2	70	0.03
		AO	172	17	35	0.33
		IB	172	6	46	0.12
		FS	160	11	53	0.17
		AB	174	17	33	0.34
		PN	178	15	31	0.33
		LO	154	55	15	0.79
		MO	164	8	52	0.13
		PC	183	16	25	0.39
		DH	162	7	55	0.11
		AE	80	13	131	0.09
		MMF	130	19	75	0.20
		AP	160	25	39	0.39
		MF	94	0	130	0.00
		MB	113	15	96	0.14

A12: Fains Island Dental Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Fains Island	**224**	SUI1	149	64	11	0.85
		SUI2	149	67	8	0.89
		DSUI1	146	72	6	0.92
		DSUI2	150	63	11	0.85
		IUI2	149	11	65	0.14
		MUM1	117	9	98	0.08
		MUM2	125	13	86	0.13
		MUM3	148	10	66	0.13
		CUM1	113	9	102	0.08
		CUM2	121	1	102	0.01
		CUM3	148	1	75	0.01
		PUM1	117	1	106	0.01
		PUM2	116	2	106	0.02
		PUM3	143	1	80	0.01
		HUM2	123	72	29	0.71
		HUM3	150	23	51	0.31
		PRLP1	117	18	89	0.17
		PRLP1	126	15	83	0.15
		LCLP1	134	15	75	0.17
		LCLP2	148	10	66	0.13
		PSUI2	149	1	74	0.01
		PSUM3	141	6	77	0.07
		GPLM1	143	28	53	0.35
		GPLM2	140	57	27	0.68
		PLM1	133	4	87	0.04
		PLM2	130	2	92	0.02
		PLM3	140	7	77	0.08

A14: Total Sample Cranial Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Total Sample	**923**	MS	449	1	473	.002
		SN	454	261	208	.55
		SF	461	259	203	.56
		MSF	493	68	362	.16
		IS	680	49	196	.25
		MIF	680	16	227	.07
		MZF	552	106	265	.29
		BB	603	9	311	.03
		AO	645	88	190	.32
		IB	629	13	281	.04
		FS	574	54	295	.15
		AB	701	50	172	.23
		PN	735	28	160	.15
		LO	617	206	100	.67
		MO	679	43	208	.17
		PC	725	124	74	.62
		DH	628	42	253	.14
		AE	319	60	544	.10
		MMF	538	102	283	.26
		AP	722	60	141	.30
		MF	378	7	538	.01
		MB	439	56	428	.10

A14: Total Sample Cranial Trait Frequencies

Site	*N*	*Trait Code*	*Unobservable*	*Present*	*Absent*	*Frequency*
Total Sample	**923**	SUI1	566	285	74	.80
		SUI2	561	332	30	.92
		DSUI1	543	352	28	.93
		DSUI2	564	306	53	.85
		IUI2	561	97	265	.27
		MUM1	451	23	449	.05
		MUM2	472	35	416	.11
		MUM3	584	45	294	.13
		CUM1	439	50	434	.10
		CUM2	456	12	455	.03
		CUM3	580	10	333	.03
		PUM1	446	9	468	.02
		PUM2	442	14	467	.03
		PUM3	573	18	332	.05
		HUM2	461	333	129	.72
		HUM3	569	118	236	.33
		PRLP1	442	83	398	.17
		PRLP1	467	72	384	.18
		LCLP1	629	46	248	.16
		LCLP2	669	42	212	.16
		PSUI2	578	6	339	.02
		PSUM3	573	16	334	.05
		GPLM1	597	69	257	.21
		GPLM2	597	183	143	.57
		PLM1	519	6	398	.01
		PLM2	507	5	411	.01
		PLM3	597	28	298	.09

Appendix B: R, C, and Covariance Matrices

B1: C-Matrix Derived from Cranial Traits Distance Matrix

AN19	BY13	HA301	JE1	MU102	FL5
0.67349222	0.38367306	-0.1254594	-0.13260694	-0.7256878	-0.07341111
0.38367306	0.32468389	-0.1193636	0.06825889	-0.4449119	-0.21234028
-0.12545944	-0.11936361	0.8500789	-0.30014361	0.3092206	-0.61433278
-0.13260694	0.06825889	-0.3001436	0.73983389	-0.3355819	-0.03976028
-0.72568778	-0.44491194	0.3092206	-0.33558194	1.5279822	-0.33102111
-0.07341111	-0.21234028	-0.6143328	-0.03976028	-0.3310211	1.27086556

B2: R Matrix Derived from the Cranial Traits Distance Matrix

AN19	BY13	HA301	JE1	MU102	FL5
0.032227866	0.018359475	-0.006003470	-0.006345491	-0.03472552	-0.003512859
0.018359475	0.015536733	-0.005711773	0.003266316	-0.02128987	-0.010160880
-0.006003470	-0.005711773	0.040677869	-0.014362435	0.01479678	-0.029396975
-0.006345491	0.003266316	-0.014362435	0.035402439	-0.01605823	-0.001902604
-0.034725521	-0.021289871	0.014796783	-0.016058225	0.07311681	-0.015839981
-0.003512859	-0.010160880	-0.029396975	-0.001902604	-0.01583998	0.060813300

B3: C Matrix Derived from the Dental Traits Distance Matrix

AN19	BY13	HA301	JE1	FL5	MU102
0.67349222	0.38367306	-0.1254594	-0.13260694	-0.7256878	-0.07341111
0.38367306	0.32468389	-0.1193636	0.06825889	-0.4449119	-0.21234028
-0.12545944	-0.11936361	0.8500789	-0.30014361	0.3092206	-0.61433278
-0.13260694	0.06825889	-0.3001436	0.73983389	-0.3355819	-0.03976028
-0.72568778	-0.44491194	0.3092206	-0.33558194	1.5279822	-0.33102111
-0.07341111	-0.21234028	-0.6143328	-0.03976028	-0.3310211	1.27086556

B4: R Matrix Derived from the Dental Traits Distance Matrix

AN19	BY13	HA301	JE1	FL5	MU102
0.039856746	0.022705473	-0.007424592	-0.007847576	-0.04294564	-0.004344412
0.022705473	0.019214540	-0.007063846	0.004039508	-0.02632954	-0.012566132
-0.007424592	-0.007063846	0.050307007	-0.017762265	0.01829943	-0.036355736
-0.007847576	0.004039508	-0.017762265	0.043782794	-0.01985948	-0.002352982
-0.042945638	-0.026329543	0.018299432	-0.019859478	0.09042480	-0.019589572
-0.004344412	-0.012566132	-0.036355736	-0.002352982	-0.01958957	0.075208834

B5: C Matrix based from the Distance Matrix Separated by Sex

AN19M	AN19F	BY13M	BY13F	HA301M	HA301F	JE1M	JE1F	FL5M	FL5F
0.678									
-0.051	0.219								
0.059	0.050	0.495							
0.094	0.093	0.237	0.515						
-0.515	0.118	-0.027	-0.528	1.226					
-0.474	-0.126	-0.201	0.804	-0.849	2.735				
0.198	0.177	0.068	-0.100	-0.135	-0.364	0.414			
0.222	-0.122	-0.175	-0.166	-0.384	-0.333	0.217	0.777		
-0.155	-0.094	-0.221	-0.879	1.101	-1.900	-0.285	0.286	2.646	
-0.057	-0.077	-0.285	0.116	-0.007	0.708	-0.189	-0.321	-0.501	0.708

B6: R Matrix based from the Distance Matrix Separated by Sex

AN19M	AN19F	BY13M	BY13F	HA301M	HA301F	JE1M	JE1F	FL5M	FL5F
0.052									
0.004	0.017								
0.005	0.004	0.038							
0.007	-0.007	0.018	0.040						
0.039	0.009	-0.002	-0.041	0.094					
0.036	-0.010	-0.015	0.062	-0.065	0.210				
0.015	0.014	0.005	-0.008	-0.010	-0.028	0.032			
0.017	-0.009	-0.013	-0.013	-0.029	-0.026	0.017	0.060		
0.012	-0.007	-0.017	-0.067	0.084	-0.146	-0.022	0.022	0.203	
0.004	-0.006	-0.022	0.009	-0.001	0.054	-0.015	-0.025	-0.038	0.047

B6: Cox Site Covariance Matrix

SN	SF	MZF	MIF	AO	SSF	LO	DH	MMF	MB
0.251959967	-0.158878505	0.038201587	-0.019480519	-0.054275474	-0.010469867	-0.104261796	0.002816901	-0.032210292	0.005263158
-0.158878505	0.237712011	-0.022282445	-0.009783368	0.046174863	0.029822161	0.052515091	0.019461698	0.007039574	-0.012765957
0.038201587	-0.022282445	0.202871411	-0.016470588	-0.038720539	-0.025546094	-0.002908514	0.019566367	0.028417819	0.019187675
-0.019480519	-0.009783368	-0.016470588	0.060419867	-0.008021390	0.005882353	-0.030128205	-0.013526570	0.004228330	0.007597896
-0.054275474	0.046174863	-0.038720539	-0.008021390	0.208421053	-0.018511066	0.007211538	-0.012329932	-0.025324675	-0.011082694
-0.010469867	0.029822161	-0.025546094	0.005882353	-0.018511066	0.133566298	0.036056049	0.021071115	-0.025684932	-0.019217570
-0.104261796	0.052515091	-0.002908514	-0.030128205	0.007211538	0.036056049	0.210084034	0.004354136	0.082949309	0.012456140
0.002816901	0.019461698	0.019566367	-0.013526570	-0.012329932	0.021071115	0.004354136	0.116367911	-0.024803388	0.020646021
-0.032210292	0.007039574	0.028417819	0.004228330	-0.025324675	-0.025684932	0.082949309	-0.024803388	0.231710362	0.017314062
0.005263158	-0.012765957	0.019187675	0.007597896	-0.011082694	-0.019217570	0.012456140	0.020646021	0.017314062	0.118451613

B7: Ledford Island Covariance Matrix

SN	SF	MZF	MIF	AO	SSF	LO	DH	MMF	MB
2.387935e-01	-1.904762e-01	-0.013168317	0.035198135	0.004702194	-0.018130746	-0.006839945	2.185891e-21	0.007417582	-0.001190476
-1.904762e-01	2.514475e-01	-0.003734130	0.000452284	-0.020301328	0.022599591	0.030095759	6.255013e-22	-0.015517545	0.013113034
-1.316832e-02	-3.734130e-03	0.226820728	0.003292362	-0.005368382	0.021621622	0.024553571	-4.220779e-02	0.044320138	0.003663004
3.519814e-02	4.522840e-04	0.003292362	0.091304348	0.003628447	-0.010606061	0.022857143	1.428571e-02	-0.009415584	0.003846154
4.702194e-03	-2.030133e-02	-0.005368382	0.003628447	0.218365062	-0.010526316	0.114897760	1.716501e-02	0.006315789	0.010224090
-1.813075e-02	2.259959e-02	0.021621622	-0.010606061	-0.010526316	0.125437865	-0.020703934	-1.020408e-02	0.008947368	-0.009831461
-6.839945e-03	3.009576e-02	0.024553571	0.022857143	0.114897760	-0.020703934	0.246894410	-1.010101e-03	0.013698630	0.003240741
2.185891e-21	6.255013e-22	-0.042207792	0.014285714	0.017165006	-0.010204082	-0.001010101	1.498678e-01	-0.022496372	0.011737089
7.417582e-03	-1.551755e-02	0.044320138	-0.009415584	0.006315789	0.008947368	0.013698630	-2.249637e-02	0.223140496	-0.009148618
-1.190476e-03	1.311303e-02	0.003663004	0.003846154	0.010224090	-0.009831461	0.003240741	1.173709e-02	-0.009148618	0.087468983

B8: David Davis Covariance Matrix

SN	SF	MZF	MIF	AO	SSF	LO	DH	MMF	MB
0.23730159	-0.145320197	0.061264822	0	-0.06666667	-0.025000000	0.00000000	-0.042483660	-0.04545455	0.045454545
-0.14532020	0.251612903	-0.054347826	0	0.13333333	-0.041666667	0.00000000	-0.026143791	0.03030303	-0.007905138
0.06126482	-0.054347826	0.184615385	0	-0.02380952	-0.057142857	0.20000000	-0.027472527	-0.09090909	0.007142857
0.00000000	0.000000000	0.000000000	0	0.00000000	0.000000000	0.00000000	0.000000000	0.00000000	0.000000000
-0.06666667	0.133333333	-0.023809524	0	0.26785714	-0.035714286	0.20000000	0.000000000	0.10000000	0.053571429
-0.02500000	-0.041666667	-0.057142857	0	-0.03571429	0.123376623	-0.06666667	-0.007575758	0.09722222	-0.033088235
0.00000000	0.000000000	0.200000000	0	0.20000000	-0.066666667	0.26666667	0.000000000	0.10000000	0.000000000
-0.04248366	-0.026143791	-0.027472527	0	0.00000000	-0.007575758	0.00000000	0.086580087	0.00000000	-0.008771930
-0.04545455	0.030303030	-0.090909091	0	0.10000000	0.097222222	0.10000000	0.000000000	0.14102564	0.000000000
0.04545455	-0.007905138	0.007142857	0	0.05357143	-0.033088235	0.00000000	-0.008771930	0.00000000	0.157258065

B9: Fains Island Covariance Matrix

SN	SF	MZF	MIF	AO	SSF	LO	DH	MMF	MB
0.2480670103	-0.152631579	0.0105633803	-0.0286195286	-1.393728e-02	0.036326531	0.014141414	-4.836415e-02	0.063458488	-0.0003805175
-0.1526315789	0.246563574	-0.0035211268	0.0134680135	3.310105e-02	0.012244898	-0.054208754	1.651652e-02	-0.083879781	-0.0136932707
0.0105633803	-0.003521127	0.2035567715	-0.0009398496	4.129129e-02	0.003699789	0.050505051	-3.787879e-02	0.015873016	-0.0124223602
-0.0286195286	0.013468013	-0.0009398496	0.0710955711	2.116935e-02	-0.004734848	0.006349206	5.517241e-02	-0.012121212	0.0016835017
-0.0139372822	0.033101045	0.0412912913	0.0211693548	2.243590e-01	-0.009615385	0.042745098	6.776264e-21	-0.058652729	-0.0303030303
0.0363265306	0.012244898	0.0036997886	-0.0047348485	-9.615385e-03	0.144593254	-0.013574661	-1.811594e-02	-0.022606383	-0.0041628122
0.0141414141	-0.054208754	0.0505050505	0.0063492063	4.274510e-02	-0.013574661	0.170807453	2.955665e-02	-0.029350105	0.0062893082
-0.0483641536	0.016516517	-0.0378787879	0.0551724138	6.776264e-21	-0.018115942	0.029556650	1.017980e-01	-0.001161440	0.0166112957
0.0634584876	-0.083879781	0.0158730159	-0.0121212121	-5.865273e-02	-0.022606383	-0.029350105	-1.161440e-03	0.163006177	0.0069930070
-0.0003805175	-0.013693271	-0.0124223602	0.0016835017	-3.030303e-02	-0.004162812	0.006289308	1.661130e-02	0.006993007	0.1179361179

B10: King Covariance Matrix

SN	SF	MZF	MIF	AO	SSF	LO	DH	MMF	MB
1.236842e+00	-0.169811321	-0.056302521	0	-0.02063492	0.00967742	-2.323290e-21	2.168404e-21	-0.020905923	-0.016098485
-1.698113e-01	0.235690236	0.062500000	0	0.03743316	-0.01231527	4.456328e-02	-1.846154e-02	0.043902439	0.009469697
-5.630252e-02	0.062500000	0.128048780	0	-0.03500000	0.06277056	-1.994302e-02	-9.523810e-03	0.003565062	0.031746032
0.000000e+00	0.000000000	0.000000000	0	0.00000000	0.00000000	0.000000e+00	0.000000e+00	0.000000000	0.000000000
-2.063492e-02	0.037433155	-0.035000000	0	0.22480620	-0.07258065	9.523810e-02	4.329004e-02	0.031194296	0.000000000
9.677419e-03	-0.012315271	0.062770563	0	-0.07258065	0.13953488	-1.764706e-02	-1.169591e-02	-0.020689655	0.000000000
-2.323290e-21	0.044563280	-0.019943020	0	0.09523810	-0.01764706	2.426004e-01	-3.952569e-03	0.004456328	0.000000000
2.168404e-21	-0.018461538	-0.009523810	0	0.04329004	-0.01169591	-3.952569e-03	1.325758e-01	0.021367521	0.000000000
-2.090592e-02	0.043902439	0.003565062	0	0.03119430	-0.02068966	4.456328e-03	2.136752e-02	0.124675325	0.019914651
-1.609848e-02	0.009469697	0.031746032	0	0.00000000	0.00000000	0.000000e+00	0.000000e+00	0.019914651	0.039183673

Vita

Michaelyn S. Harle Elder was born October 1977 in Harrisburg, Pennsylvania. After a trip to Greece when she was thirteen, she decided to switch her career goal from opening an art gallary in Paloromo, Sicily (the Godfather was a favoriete movie in the Harle household) to a career in archaeology. In order to pursue her goal, she attended the Indiana University of Pennyslvania where she received a Bachelor of Arts in 2000 with a concentration in archaeology. She moved to Knoxville, Tennessee in 2000 to start her graduate career, dragging her future husband Joshua Elder with her. Upon receiving her Masters of Arts in 2003, she bagan the PhD program. She is currently employed at the Tennessee Valley Authority and is awaiting the next great career adventure.